DOCUMENT RESUME

ED 043 988 EC 030 424

AUTHOR	McGowan, John F.; Gust, Tim
TITLE	Preparing Higher Education Facilities for Handicapped Students.
INSTITUTION	Missouri Univ., Columbia.
SPONS AGENCY	Rehabilitation Services Administration (DHEW), Washington, D.C.
PUB DATE	Feb 68
NOTE	107p.
EDRS PRICE	EDRS Price MF-$0.50 HC-$5.45
DESCRIPTORS	*Architectural Barriers, Building Design, Campus Planning, College Buildings, *Exceptional Child Services, Facility Improvement, *Physically Handicapped, Student Personnel Services
IDENTIFIERS	Missouri University

ABSTRACT

The report summarizes significant events since 1959 in the University of Missouri's program to modify its physical plant and educational facilities and to organize and expand its student personnel services to enable handicapped students to attend the University. Reviewed are the program plan, site and building modifications, student services, and the current status of the program and recommendations for the future. Appendixes include photographs of campus modifications, and building, facility, and bus specifications. (KW)

ED043988

PREPARING HIGHER EDUCATION FACILITIES for HANDICAPPED STUDENTS

John F. McGowan
Project Director

Tim Gust
Project Coordinator

Final Report Prepared for the Vocational Rehabilitation Administration, Department of Health, Education, and Welfare, for Research and Demonstration grant RD-629.

Establishment of the University of Missouri as a Modified Regional University Facility to Serve the Physically Handicapped.

February, 1968 Columbia, Missouri

EC030424

ED0 43988

PREPARING HIGHER EDUCATION FACILITIES
for
HANDICAPPED STUDENTS

by

John F. McGowan
Project Director

Tim Gust
Project Coordinator

ABSTRACTED - CEC ERIC

Final Report Prepared for the Vocational Rehabilitation Administration, Department of Health, Education, and Welfare, for Research and Demonstration grant RD-629.

Establishment of the University of Missouri as a Modified Regional University Facility to Serve the Physically Handicapped.

February, 1968

Columbia, Missouri

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

PREFACE

The University of Missouri initiated a program, starting in 1959, to modify its physical plant and educational facilities, and to organize and expand its student personnel services, so that handicapped students would be able to attend the University. This report will attempt to report significant events from the start of the program up to the present time.

A special word of appreciation and thanks is due to Mr. Robert Prouty who served as Project Coordinator during the initial phase of the project and under whose direction our initial plans for campus modification and modified personnel services were developed; also to Mr. Michael Ryan who assisted in the preparation of this final report and to Mr. James A. Irvin, Coordinator of Handicapped Student Services at the present time.

We are hopeful that this report, in addition to meeting our contract obligations to the Vocational Rehabilitation Administration, will be of help to personnel in other institutions of higher education who are considering similar modifications on their own campuses.

John F. McGowan
Tim Gust

Columbia, Missouri

December, 1967

TABLE OF CONTENTS

Chapter Page

I THE PROGRAM PLAN 1
  Introduction 1
    Need for a Modified Campus 1
    University Administration of the Program 4
  The Grant Application. 5
II SITE AND BUILDING MODIFICATIONS. 7
  Development of the Campus Site 7
    Sidewalks. 8
    Ramps. 9
    Handrails. 11
    Curbs. 11
    Bus Loading Zones. 11
  Building Modifications 11
    Status of University Buildings at the Start of the Program. 12
    Elevators. 13
    Doorways 15
    Ramps. 16
    Restrooms. 18
    Special Building Modifications 19
    Dormitories. 20
III STUDENT SERVICES 23
  Handicapped Student Services 23
    Direct Services to Students. 23
    Consultant to the Campus 33
    Personnel Services (under Consulting). 34
    Academic Departments 42
    Physical Education 43

Chapter Page

Physical Therapy 43

Speech and Hearing 44

Other Services 45

IV THE FUNCTIONING PROGRAM, RECOMMENDATIONS, AND THE FUTURE . . 47

The Student Body 47

Academic Performance 48

Social Performance 49

Present Facilities and Administration. 49

Recommendations -- The Future. 50

V THE PROJECT IN REVIEW. 56

APPENDIX A: Photographs of Modifications on the University of Missouri Campus 60

APPENDIX B: American Standard Specifications for Making Buildings and Facilities Accessible to, and Usable by, the Physically Handicapped 86

APPENDIX C: Specifications for Handicapped Student Bus. . . 98

APPENDIX D: Brochure: Educational Opportunities for the Handicapped. . . . .

TABLES:

Table I Information Requests and Applications Sent During 1966 25

Table II Special Admissions Committee Activities . . 28

Table III Counseling Activities 32

Table IV Summary of Students 1965-66 52

Table V T-Score Means and Standard Deviations . . . 54

Table VI Zero Order Correlations and Selected Multiple Correlation with First Semester GPA. 55

CHAPTER I

THE PROGRAM PLAN

INTRODUCTION

In response to the expressed need of a substantial number of handicapped students, the University of Missouri initiated a program in 1959 to modify its physical facilities and expand its personnel services, so that physically handicapped students would be able to attend the Columbia campus of the University.

We applied to the Vocational Rehabilitation Administration, Department of Health, Education and Welfare, for a Research and Demonstration grant to help implement the program. We were subsequently funded to establish a regional educational facility for Federal Region VI. This region is composed of the states of Missouri, Iowa, Minnesota, North Dakota, South Dakota, Nebraska and Kansas.

The program to modify our physical facilities started during 1960 and the formal grant period ended in October, 1966. In actuality, campus modifications have continued up to the present time and will continue indefinitely as additional needs are identified through the use of campus facilities by handicapped students.

The physical facilities of the campus have now been modified, and our personnel services reorganized and/or expanded, to a point where handicapped students can now enroll at the University. This report will explain how the program was planned and implemented.

Need for a Modified Campus

Starting in 1955, the University had expanded the curriculum offerings of its Guidance and Counseling courses to include courses leading to both the Master's and Doctor's degree in rehabilitation counseling, under grant support from the Vocational Rehabilitation Administration. As a result of this program, several faculty members were added to our staff who were personally and professionally interested in problems related to the rehabilitation of physically handicapped college ability students. There were also a substantial number of faculty in the School of Medicine and in the departments of Speech and Hearing and Special Education who were equally interested in this problem.

When the University received notification in 1958 that federal matching funds could be made available for the establishment of research and demonstration facilities, we decided to investigate the need for the establishment of a regional educational facility to meet the needs of college ability students who were being denied the opportunity to receive a degree from an institution of higher education.

We submitted a planning grant application to the Vocational Rehabilitation Administration for funds which would allow us to study the problem and were subsequently funded for the period December 1, 1959 through August 1, 1960. The purpose of the planning grant was to allow us to study the following:

1. The need for the establishment of a special University facility within this region.
2. Curriculum requirements and job opportunities for college graduates with severe handicaps.
3. Required special modifications of the existing University facilities and services.
4. The need for the establishment of entirely new facilities and services.

The work that we completed during this planning grant period resulted in the publication of two project reports. The first of these is entitled "A Study of Handicapped Population, Age 18 to 21, Inclusive, Residing in Health, Education and Welfare Region 6," and "A Study of Predicted Academic Achievement and Projected Distribution of Severely Handicapped Students According to Enrollment by College at the University of Missouri." A brief summary of these two reports is presented below:

Project Report Number 1, Summary

The data presented in Report Number 1 indicates that at least three hundred severely handicapped students, who are good college potential, graduate from high school and are ready for college each year. Approximately sixty percent of these students are men. Of these three hundred potential students it is estimated that at least forty-six have severe ambulatory handicaps.

At the present time no university within the boundaries of Region VI provides for these severely handicapped students. On the basis of the data presented in this report there seems little doubt that a sufficient number of severely handicapped high school seniors with college potential do graduate each year within Region VI, and that definite need for a modified university facility does exist.

Project Report Number 2, Summary

On the basis of the obtained information it appears reasonable to expect severely handicapped students to achieve at the same academic level as their non-handicapped classmates. Their absenteeism rate and drop-out rate are expected to be comparable to that of the non-handicapped.

The severely handicapped will probably enroll in the College of Arts and Science in the greatest number, followed by Education, Engineering, Nursing, and Agriculture and Forestry. In general, the prospective enrollment of the ambulatory handicapped follows the same approximate distribution.

After graduation it appears likely that the severely handicapped will be able to find employment in positions commensurate with their education and interests. They will be able to assume their role as contributing citizens in our democratic society.

The data in Tables I and II suggests that our plans for campus modification should give priority to the Colleges of the University of Missouri in the following order: (1) Arts and Science (including pre-journalism, pre-law, pre-business, pre-medicine), (2) Education, (3) Engineering, (4) Nursing, (5) Agriculture and Forestry. On the basis of the available information, it is difficult to say if the limited number of handicapped students who have previously enrolled in the Nursing, Agriculture, and Forestry curricula at other institutions indicates that handicapped students do not enroll in these curricula, or that very few such schools have been modified to the extent that they could attend. This will require further study and it would appear that top priority should now be given to Arts and Science, Education and Engineering.

University Administration of the Program

The information contained in the reports summarized above was then presented to administrative officers at the University of Missouri with the recommendation that required matching money be made available and that we proceed with a plan to modify the campus. Dr. Elmer Ellis, who was then serving as President of the University,personally supported the plan and appointed a committee to administer the program.

Since the project would be concerned with the modification of campus-wide facilities and would involve students enrolled in all divisions of the University, the administration of the grant was placed under the direction of Dr. Thomas A. Brady, Dean, Extra-Divisional Administration. A committee was appointed consisting of the Project Director, Dr. John F. McGowan, who was charged with the responsibility for implementing committee decisions; Dr. Robert Callis, Director, Testing and Counseling Service; Dr. William Galeota, Director, Student Health Service; Dr. Geraldine Fergen, Director of Special Education; Mr. Raymond Halbert, Manager, Physical Plant; Mr. Harold Condra, Director of University Housing; and Mr. Robert Prouty, Research Consultant.

After the initial application was prepared and approved and the program became operational, a smaller executive committee was appointed. This committee was given actual responsibility to encumber University funds and to see that contract arrangements were followed. This committee consisted of Dr. Thomas A. Brady, Dean, Extra-Divisional Administration; Professor John F. McGowan, Project Director and Professor of Education; Mr. Dale O. Bowling, Business Manager for the University; and Loren G. Townsend, Dean, College of Education. This committee reported directly to the President through its chairman.

THE GRANT APPLICATION

The committee appointed by the President prepared an application which was submitted to VRA on March 10, 1960. The title of the project was "The Establishment of the University of Missouri as a Modified Regional Special University Facility to Serve the Severely Handicapped." The statement of the purpose of the project as originally submitted in 1960 is reproduced below:

A. Purpose

The purpose of the project is to modify the facilities, and organize the services, of the University of Missouri so that severely handicapped students of this region will be able to attend the University and receive a college education. The three major factors involved in this project are: (1) the modification of the physical facilities of the University; (2) the organization and coordination of services currently available; and (3) the creation of new services and facilities.

Upon the completion of the project the intellectually gifted, severely handicapped students of this region will be able to receive a college education commensurate with their ability in the field of their choice, and in a setting providing them with optimum opportunity for independence and growth. The establishment of such a regional facility seems to offer the most appropriate solution to the rehabilitation of any significant number of intellectually gifted, severely handicapped students.

B. Type

The project would result in the establishment of a special regional college training facility. The University of Missouri would be modified so that severely handicapped students could attend. The facility will serve the needs of three or more of the states in the immediate area, as evidenced by the attached statements from the State Directors of the Region.

The project would also serve as a demonstration project. We would show how such modified facilities could be established on other selected campuses throughout the United States. Data on the total cost of the project, architectural recommendations and construction plans, organizational structure within the University, medical services, physical education facilities, etc., will be made available in progress reports as well as in the final report.

This report will describe how the statement of purpose was implemented.

CHAPTER II

SITE AND BUILDING MODIFICATIONS

At the time when we initiated the modification of the physical plant in 1960, the University's campus at Columbia consisted of seventy-four buildings located on 350 acres.

To help determine the best sequence of site and building modifications, the St. Louis architectural firm of Hellmuth, Obata, and Kassabaum was employed. On March 1, 1960, they submitted a master plan listing needed architectural changes and proposed a schedule for each year of the five-year project. This master plan established priorities for site and building construction and it was easily adapted to the _American Standards Specifications for Making Buildings and Facilities Accessible to, and useable by the Physically Handicapped_ when they were published in 1961. See Appendix B for the _American Standards_.

The rest of this chapter is divided into a description of the work done to modify the campus site and then into a description of the work done within and upon the campus buildings. Modification costs are included in the subsection which describes each particular type of modification. The illustrative pictures which appear in this chapter are accompanied by non-technical descriptions. Appendix A provides additional pictures illustrating the various modifications plus a detailed description of construction specifications. THE READER INTERESTED IN TECHNICAL INFORMATION SHOULD CONSULT APPENDIX A.

DEVELOPMENT OF THE CAMPUS SITE

When we submitted the original application we had hoped to be able to enroll our first handicapped students in the Fall semester of 1962. In order for us to be able to do so we first had to remove many of the barriers that then existed on the campus site. The architectural studies conducted during the planning grant had indicated that modification should begin with the campus topography. In the first year of the five year grant program, work was immediately begun to eliminate the barriers which sidewalks, steps, and curbs imposed upon a person in a wheelchair. Sidewalks were remodeled, steps were converted into ramps, handrails were placed on ramps, curbs were cut down, and bus loading zones were built. Each type of campus site development is described in the following sections.

Sidewalks

The University Board of Curators now requires that all newly constructed buildings be built so as to be fully accessible to the handicapped. The illustration below shows how the graduated sidewalk near the Brady Commons permits easy wheelchair entrance.

Many of the sidewalks at the University had been constructed with such steep slopes that a person in a wheelchair was unable to traverse them without aid. These sidewalks were remodeled so that they were more level, or else new sidewalks were built. The new sidewalks were generally serpentine (i.e., winding)

so that they would have a gradual slope which the student in a wheelchair could easily negotiate.

New sidewalks were also built to permit access to new entrances to existing buildings. The necessity of relocating entrances to benefit handicapped students incurred a significant expense since it required new pedestrian traffic routes, new sidewalks, and the removal of shrubbery and other obstacles.

As more wheelchairs came into use, the existing sidewalks often became congested. This congestion is common on today's college campuses since increased enrollments have made many of the existing narrow walks inadequate. The solution is to widen the sidewalks and to thereby permit increased traffic flow. Sidewalks were widened whenever necessary and all students benefited.

The final note on sidewalk modification concerns the work done to remove cracks, bumps, and changes in elevation. Because such conditions can be serious obstacles to the wheelchair student who has limited mobility power, frequent repairs are made.

Ramps

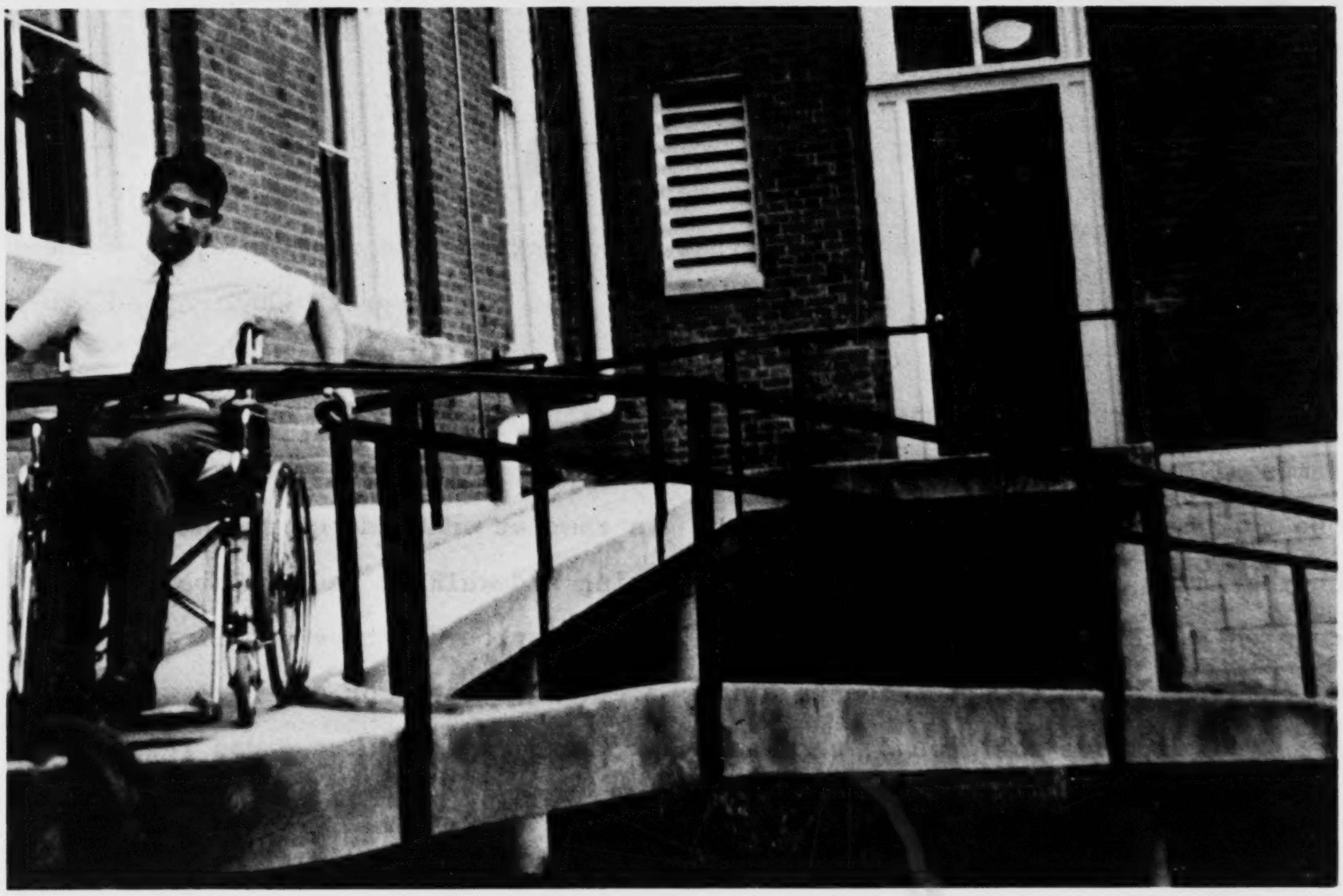
In September, 1960, a person who wanted to traverse the campus had to climb many flights of steps. One of the first tasks assigned to men employed by the University ground crew was to build ramps so that the severely handicapped student would be able to get around the campus.

Over thirty-five ramps were constructed from reinforced concrete. These ramps allow handicapped students to bypass steps and to have access to buildings. One type modification involved connecting a ramp at one side of the steps. Another type modification brought the existing sidewalk up to the level of a door entrance to provide an inclined walk. The price of these modifications depended upon the existing construction, e.g., when the door entrance was set fairly high above the ground, then a longer, more expensive ramp was required.

When buildings had no basement or ground floor level, it was necessary to provide more extensive ramping. The illustration below shows a hairpin ramp which leads from ground level up to the first floor of the Engineering Building. Note that the student uses the handrails in making his descent.

It was necessary to keep the exterior ramps leading into heavily used buildings free from ice and snow so that they would not be dangerous. This can be accomplished by heating the ramps with either electricity or steam. Since it is less expensive to operate the steam heated unit, copper tubing was installed below the surface of many of the exterior ramps and steam is pumped through the tubing during inclement weather.

As might be expected, the cost of constructing more than thirty-five ramps was second only to the cost for installing elevators. Approximately $78,000 was spent to build ramps which were as short as 5 feet and as long as 144 feet. The individual cost for a ramp varied from $75 up to $3,500.



Handrails

Handrails were placed on both sides of all ramps. They are 2" in diameter and are 32" from the ramp's surface. The cost for assembling, painting, and installing handrails was about $10 per linear foot.

Curbs

Curbs were beveled at crossings to make miniature driveways so that wheelchair students could roll down from one sidewalk and then cross the street in the regular pedestrian lanes to the other sidewalk. Clearly painted lines allow students in pedestrian lanes to take precedence over motorists. To prevent other students from stumbling because of the change in sidewalk elevation, yellow chevrons were painted on the entire cut-down curb and clearly identify the difference in elevation.

Over 45 different curb locations were beveled. The cost of cutting down a curb was dependent upon the height of the curb. If there were many power and service lines under a curb, then the cost was increased since extra construction was needed to reroute the cables. For these reasons, the price for cutting down a curb ranged from $100 to $275.

Bus Loading Zones

A modified bus was obtained to transport handicapped students since classroom buildings and dormitories are often quite separated on the Columbia campus. It was necessary to construct a number of special recessed bus loading zones. These special bus loading zones were cut out of the sidewalk area. They were recessed into the side of the street and permitted the bus to stop in an off-street area. Construction of these special zones required removing some of the existing greenery and sidewalk and replacing them with 60 feet of rolled curb. The cost of constructing three special recessed bus loading zones was almost $6,500.

BUILDING MODIFICATIONS

Since handicapped students at the University of Missouri are encouraged to lead the same type of academic life as all other students, they must be able to have full use of administration, dormitory, and instructional buildings. Many building modifications were necessary in order that handicapped students would have every possible chance to participate in regular student activities and student life. Elevators had to be installed, doorways widened, restrooms modified, telephones placed at the proper height for a person in a wheelchair, ramps built to eliminate steps between different wings of the same building, and many desks, chairs, etc. had to be rearranged to modify classrooms. Considering the amount of work done and the fact that classrooms are located in a variety of buildings about the entire campus, it is not surprising that building modifications at the University were the most expensive part of the modification program.

The next section of this chapter will provide some background information on the age of the University buildings when the project started. Then the remaining section will tell about the different types of modifications done within buildings and conclude with a description of modifications within the student dormitories.

Status of University Buildings at the Start of the Program

In 1960, the University of Missouri's Columbia campus was composed of 74 buildings. Twenty-nine buildings were erected before 1930 and were still being used for either instructional or administrative purposes when the campus modification program began. In determining which of these 29 buildings should be modified, primary consideration was paid to whether a building would conceivably be frequented by handicapped students. If the building was an instructional facility, then it was necessary to determine how many classrooms it contained and to compare its number of classrooms with other buildings which had all their floors regularly in use for classes. If the building was used primarily as an administrative facility, then it was necessary to decide whether students would often have business there. After considering each of these older buildings, it was decided that 13 of them should be modified.

Forty-five instructional buildings had been built between 1930 and 1959. Most of the student and faculty housing buildings were also constructed after 1930. In planning buildings modifications, the criteria of usefulness to handicapped students was again applied. The result was that 16 of these instructional buildings were modified. Five student dormitories and several married student apartments were also modified.

Through an agreement made with the curators, all buildings constructed after 1960 are built so that they are accessible to the handicapped. Twelve buildings have been erected under this University policy, and the cost for constructing them to meet the needs of the severely handicapped has been solely borne by the University.

Elevators

In order that multi-storied buildings would be available to wheelchair students, fifteen elevators were installed at a cost of $335,000. This expenditure for installation and modification of elevators accounts for almost one-half of all program funds.

Whenever possible, existing elevators which had either single or by-parting manual doors were converted to automatically operated doors. This was an economical solution in four buildings where it was possible to install an electro-magnetic device and produce a totally automatic elevator at a cost of approximately $7,000 to $8,000 per building. Unfortunately, many other buildings needed new elevators which were far more expensive to install.

For new installations, the minimum size elevator used was 2,000 lb. capacity and had inside measurements of 4'2" wide by 5'6½" front to back distance. The control panel was placed 40" from the floor with the position indicator placed where the person in a wheelchair could most easily see it. A consulting architectural firm always helped plan the installation of a new elevator by evaluating the structure to be remodeled and submitting installation guidelines. Depending upon various problems encountered, a one-story elevator cost from $20,000 to

$25,000 in comparison to a four story elevator which cost from $35,000 to $42,000.

The least expensive new installation was made in those buildings which had incorporated space for an elevator shaft when they were built. Similarly, it was not much more expensive to install a small elevator in those older buildings which had an existing dumb waiter space. This latter procedure was sometimes ruled out because the dumb waiter shaft was too narrow to permit an elevator large enough for the number of handicapped students who were expected to use the building. New installations became more costly when there was no existing space to use as an elevator shaft.

Various alternatives were possible when an elevator had to be installed in a building which had no shaft space. The elevator could be attached to the outside of the building, but in line with one end of a corridor so that passengers could exit on the corridor of each floor. Another installation used one side of an interior staircase which went from the basement to the top of the building. In this case, the elevator exits were at the same point as the exits of the remaining staircase. When there was no other possibility, an elevator was installed by selecting an appropriate place in the building and removing existing office or classroom space so as to provide an elevator shaft.

Certain problems caused the price of the elevator installation to escalate quickly. As mentioned in the last paragraph, it was sometimes necessary to tear down and remodel existing space to form an elevator shaft. When an installation involved cutting through many floors and structural supports, then the elevator became quite costly.

The installation of elevators in those older buildings which had either wooden floors or inadequate structural support was usually higher in price. These older buildings didn't have enough support to carry the burden of a penthouse housing the equipment of a cable type elevator. Instead it was necessary to install a pump and equipment room adjacent to the elevator which provided the hydraulic thrust needed to power an elevator piston equal in height to the height of the last floor served. Installation of the hydraulic type elevator was always more expensive than installation of the cable type elevator.

A final problem involved the time required to install a complete elevator. Each installation presented certain problems so that the time per installation varied from four to twelve months. The most difficult installation involved making space underground for an elevator piston and required twelve months because it was necessary to drill through about twenty feet of flint bed-rock. The flint rock cut down the drilling speed to approximately one inch per day. This particular installation was quite costly because men worked on it for the better part of one full year, at considerable loss to the contractor.

Doorways

The need for new doorways was caused by the fact that the existing doorways were too narrow for wheelchair students and by the fact that new traffic patterns were created by passengers emerging from the recently installed elevators. Installing a new door in an existing wall was often easier and more economical than modifying the old entrance. The cost of installing a new doorway to a room within a building depended upon both the nature of the original material and the amount of electrical wiring and plumbing encountered. The average cost for cutting through an interior non-supporting wall and installing a door was about $210.

It was more expensive to install an outer door; the cost of cutting through and installing a door in an exterior wall varied from $300 to $500. The cost was closer to $300 when an existing window and its surrounding exterior wall could be removed. The exterior doorway thus could be created at less expense because less of the exterior wall had to be removed.

The total number of doorways, both interior and exterior, which were modified or installed for handicapped students was twenty. The cost of each installation ranged from $125 to $1000 but the latter figure also includes the cost for modifying the existing threshold and landing. The overall cost was approximately $15,500.

1. Automatic Doors. Double electric doors were installed at the Memorial

Student Union. This busy entrance requires that the handicapped student be able to enter quickly and easily.

The illustration below shows a wheelchair student using a "supermarket type" door. This door will not activate if someone is on the other side of the door. The approximate cost for the entire installation shown below is $11,000 to $15,000.

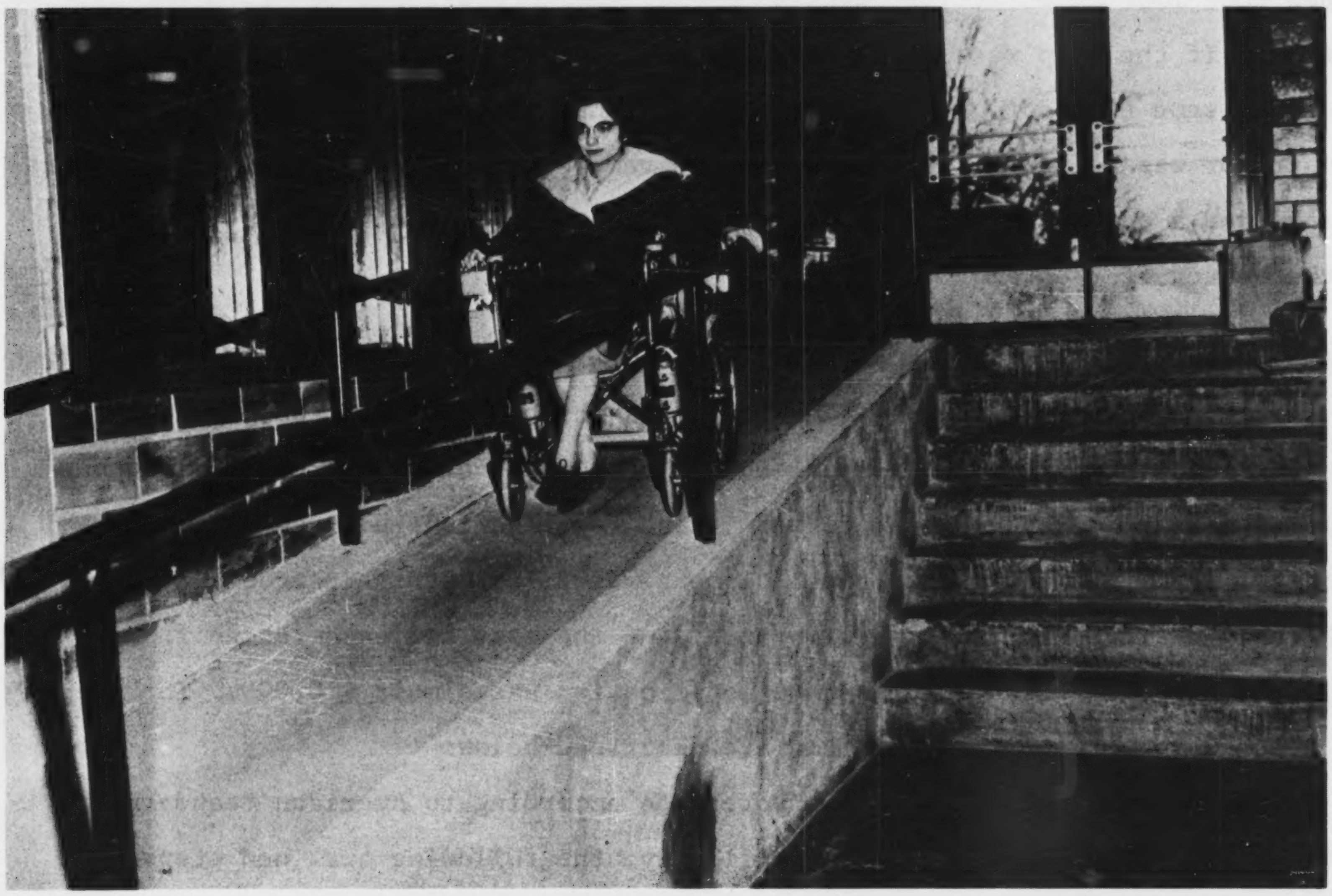
Ramps

A common problem encountered with the older buildings on our campus involved providing access to the split foyer type of entrance arrangement where no floor was at actual ground level. The question at that point involved ramping either upward or downward to either the basement or first floor levels. In almost all cases it seemed most desirable to ramp down toward the basement floor when modifying the split foyer designed building. Aesthetically and practically this type of ramp as compared to one reaching upward to a first floor appeared

much more feasible. An exception to this situation was made when only the floor above ground level was being made accessible in a particular building. In all other situations, either the below-ground level floor alone would be accessible or an elevator providing access to all floors above would be made available.

In some situations where buildings had been remodeled there were changes in corridor levels within the buildings that were barriers to the handicapped if stairs were involved. These short changes in elevation within a particular building complex were eliminated by (1) ramping the entire width of the corridor if the distance was not too great and the ramp would not interfere with existing doorways in the corridors; or (2) ramping one side of the existing stairs with a traditional type of ramp including handrails, etc., that left sufficient room for able-bodied traffic flow. The second situation is illustrated below.

Different types of ramps were used to gain access to a sub-ground level



floor. Where external steps extended downward toward a door opening directly to the basement floor, it seemed appropriate to ramp the external steps and provide proper door clearance. If internal steps were involved leading from the door down to the basement floor level, it again was possible to ramp one side of the steps. This was done in such a way as not to encumber passage for able-bodied students.

An interesting problem involved gaining access to a basement floor where no previous entrance was available. This particular problem was solved by excavating a channel leading downward to a window in a corridor which was changed and fitted with a regular door opening. This channel was ramped and the door provided opened directly onto the basement floor.

Sometimes, the entrance to a classroom or restroom included a step upward or downward. If the step was down into the room, a simple ramp with a one-inch per foot incline usually permitted ease of entrance without complicating traffic flow. If the step was upward into a room, the problem of ramping the step but at the same time not creating a hazard for the able-bodied passing through the corridor was solved through the use of a ramp built in a circular manner. This involved a one to twelve incline graduated in a radial manner from a point in the center of the ramp.

Restrooms

For each of the twenty-four buildings which would be frequently used by handicapped students, it was decided that at least one men's restroom and one women's restroom should be modified. Each modification involved the doorway, toilet stall, mirror, paper towel dispenser and, for men's restrooms, the urinals. More than fifty restrooms were modified and the cost for each ranged from $75 to $300. The total cost for restroom modification was almost $10,000. The steps followed in restroom modification are described below:

Modifications of restrooms were made according to American Standard specifications 5.6 to 5.6.6. More specifically, the following outlined steps were used in actual remodeling of restrooms.

(1) Toilet stall - 36 inches width
    A. Swing-out door (where door is necessary), 32 inches width, gravity hinges.
        1. Small,inexpensive pull on above door.
    B. Handrails on each side of stall.
        1. One and one-half inches diameter with approximately 1½ inches clearance between rail and wall.
        2. Rails to be 24 inches long with center about even with front edge of stool.
    C. Tissue roll hanger to be clear of grab rail. If moved, not higher than 40 inches from floor.

(2) One mirror (either replacement or regular one in restroom) no higher than 40 inches from floor, bottom of mirror.

(3) Paper towel dispenser (usually one already in the restroom, otherwise a replacement) no higher than 40 inches from the floor, bottom of dispenser.

(4) Main doorway to restroom (when coming straight in) should be 32 inches when door is open. If chair must go through doorway at an angle rather than straight through, check proper clearance with chair.

(5) In men's room, urinals should be 19 to 22 inches from floor.

Special Building Modifications

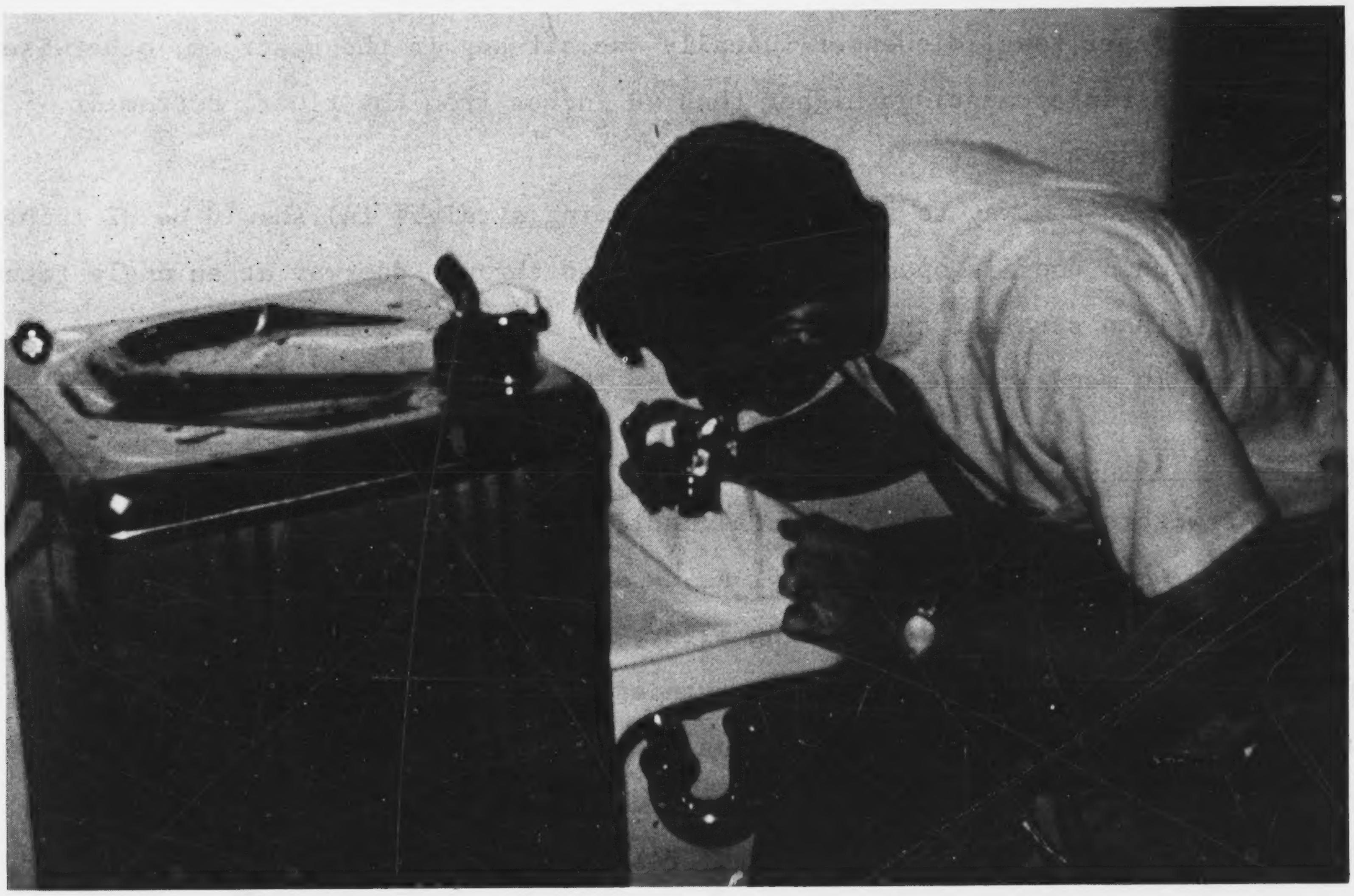
As with other buildings, special modifications to administrative and service facilities were sometimes necessary, As an example, a student union facility usually includes game rooms, bowling alley, etc., which require some additional modifications as well as the usual entrance and restroom modifications. In facilities such as these, service ramps and loading entrances can be utilized to make initial modification an easier matter. The remainder of the work within a typical building included modifying the restroom, making drinking fountains accessible, and lowering a wall mounted public telephone (if available) to a height of 48 inches from the center of the dial to the floor.

Dormitories

The modification of dormitory buildings was initiated with the construction of necessary ramps. Dormitory construction involved the students' rooms, the restrooms, the laundry room and the cafeteria.

1. Student's Room. Modifications within a student's room concentrated on the wheelchair user's daily use of furniture. Closet racks were dropped to allow one to reach hangers from a sitting position. Desk tops were raised to allow wheelchair arm-rests to slide under.

In the hall outside the student's room, wall phones were lowered to place the dial's center 48 inches from the floor, and drinking fountains were lowered to permit a student to drink while sitting in his wheelchair. The illustration below shows a special fountain located 30 inches above the floor.



2. Dormitory Restrooms. The typical restroom modifications for regular buildings were followed with the addition of modifying showers and bathtubs. Shower stalls were modified by installing a seat 20 inches from the floor, a flexible adapted shower extension, and grab bars on two sides of the shower stall.

Modification of the bathtub involved installation of a bar 10 inches above the tub parallel to and along the length of the tub with a vertical two foot bar mounted above the edge of the tub next to the water controls, originating approximately six inches above the top of the tub. In men's dormitories an additional installation included providing an electrical outlet no higher than 40 inches from the floor and near a mirror for students using an electric razor.

A special modification which was helpful to students confined to wheelchairs was the installation of a partition between two toilet stalls which extended from the wall outward only half as far as the usual partition. The remaining need for privacy was arranged by the use of a heavy vinyl curtain which completed the partition. The reason for this type of arranagement was that for some students a transfer from wheelchair to toilet seat in a narrow toilet stall is not possible unless they make use of a trapeze bar suspended from the ceiling. However, with the flexible partition (through the use of the vinyl curtain) the student was able to maneuver his wheelchair into position to make a side transfer rather than a typical front transfer which is made in the usual toilet stall width of 36 inches.

3. Laundry Room. Before the wheelchair student could enter the laundry room, the door had to be widened. Once the doorway was modified, he could use the laundry machinery without problem. However, the folding counters and ironing tables were too high. Once these were lowered to the usual desk or table top height, the handicapped student was just as much self-sufficient in the laundry room as was any other student.

4. Cafeteria. Cafeteria modifications involved widening the cash register lines so that a wheelchair and tray could easily pass through. Little else was necessary since the food counters were already placed at a convenient height for

a person sitting in a wheelchair. Most students now purchase wheelchairs with removable desk type arms and thus can use the cafeteria tables without difficulty.

CHAPTER III

STUDENT SERVICES

The handicapped student program required the initiation or expansion of certain services within the University of Missouri in order to better assist handicapped students during their college career. These services were developed as an integral part of established University services in order to insure their permanency and compatibility in the total philosophy of the University.

HANDICAPPED STUDENT SERVICES

The coordination and implementation of the services is the primary responsibility of the office of Handicapped Student Services. The office of Handicapped Student Services attempts to coordinate available resources to meet the special needs of the physically handicapped student. Several functions are necessary in the coordinating process, involving both direct services to the handicapped students and others which are available to all students.

Direct Services to Students

Handicapped students are encouraged to utilize the Handicapped Student Services throughout their college careers. The Handicapped Student Services provides a variety of services in its desire to meet the needs of the handicapped. In the following paragraphs, some of the activities of the office of Handicapped Student Services will be described.

1. Information to agencies and applicants. Handicapped individuals, vocational rehabilitation counselors, school counselors, educators, business people, and other interested parties frequently request information about the handicapped student program at the University of Missouri. All requests for information are sent to the office of Handicapped Student Services.

The office has prepared a brochure describing the opportunities for the handicapped at the University of Missouri. The brochure summarizes the information necessary for a handicapped person who is considering enrollment in the

University. It contains information about the University in general and the services for the handicapped in particular. It includes general information on the curricular offerings of all colleges and schools, admissions procedures, fees and other costs, services available, information on student activities, and information concerning the accessibility of the University to the handicapped.

The brochure, along with requested application and informational materials are mailed to the requesting agency or individual. Many requests from various parts of the United States and the world are honored each year. Table 1 (page 25) provides a summary of the number and origin of application and information requests during the 1966-67 academic year. Requests from the states of HEW Region 6 were the most prevalent. A copy of the brochure is found in Appendix D.

2. Special Admission. The materials which are mailed to the requesting agencies and individuals result in a number of applications for admission each year. The office of Handicapped Student Services assembles the application materials into a file for each applicant. A complete file of application materials includes an application for admission, a complete medical history and record of a recent physical examination, a supplemental medical form describing the nature of the handicap, all transcripts of previous academic work, an information form for the use of the office of Handicapped Student Services, an application for housing, a completed set of Freshman Placement tests or other appropriate aptitude batteries, and any other information which the applicant might wish to submit to provide a full account of information which might be considered in his application for admission.

Upon receipt of application materials from several applicants, the Coordinator of Handicapped Student Services calls a meeting of the Special Admissions Committee for the Admission of Handicapped Students.

The Special Admissions Committee was formed in order to bring the knowledge of a number of specialists to bear in determining whether a handicapped applicant appears to have the physical and intellectual capability necessary to complete a college degree. The present composition of the committee includes a

TABLE I

INFORMATION REQUESTS AND APPLICATIONS SENT DURING 1966

	REQUESTS FOR INFORMATION		APPLICATIONS	
Origin	Students	Agencies	Sent but not Returned	Returned-Completed
Alabama				1
Arkansas	3		1	
California			2	
Canada	1	1		
Dist. of Columbia		2		
Colorado	1	3	2	1
Connecticut	2	1	2	1
Florida		1		2
Georgia	4		3	1
Hawaii	1			
Idaho	1	1	1	
Illinois	1	2	1	2
Indiana	2		1	2
*Iowa	6	5	3	12
*Kansas	3			1
Louisiana	1	1		
Maine				1
Maryland				1
Massachusetts	3			
*Minnesota	8	2	4	
*Missouri	19	6	13	24
*Nebraska	4	3		
New Jersey	4	1	2	
New York	12	2	6	6
North Carolina	1			
*North Dakota	3	2	1	2
Ohio	9	2	4	1
Oklahoma	1		1	
Pennsylvania		1		2
*South Dakota	2	1	1	1
Tennessee	1			
Virginia	4			
West Virginia	3		1	
Wisconsin	4	2	1	2
Total	104	39	50	63

*States included in Region VI of Health, Education, and Welfare physician from the Student Health Service, the Associate Director of Admissions for the University of Missouri, a member of the academic faculty representing the division in which the person wishes to be enrolled, and the Assistant Director of Testing and Counseling for Handicapped Student Services. Utilizing the experience and special training of these committee members permits the committee to make a probable estimate of an applicant's success, based on all factors.

After the application materials are reviewed by the Special Admissions Committee, the student's admission status is determined by vote of the Committee, and he is notified of the decision. As a general rule, the action of the Committee results in either rejection of an applicant or tentative acceptance for admission. If an applicant is tentatively accepted, the office of Handicapped Student Services contacts the applicant and asks him to come onto the campus for a personal interview. The interview permits further assessment of the probability for success of an applicant as a student at the University of Missouri.

The personal interview includes an evaluation of the applicant's physical functioning, a speech and hearing evaluation, an interview with the Coordinator of Handicapped Student Services, completion of any tests which may not have been completed prior to the interview, and a tour of the facilities of the University of Missouri.

The evaluation by the physical therapist and physician is an attempt to assess the applicant's functional capability on the campus and to recommend to the applicant ideas which may make for better functioning or which may be required before his admission can be approved. Often prescribed by the physical evaluation are particular appliances, a more appropriate wheel chair, or the consideration of personal attendant needs.

The Speech and Hearing Evaluation is performed to determine whether the student can communicate effectively and whether any remedial services in speech and hearing could benefit the applicant if admitted.

The interview with the Coordinator of Handicapped Student Services is primarily an opportunity for the applicant and his family to openly discuss concerns and questions which they have about the life of a handicapped student at the University of Missouri. The interview often deals with very specific questions and, more often, deals with the anxieties and apprehensions which are developing as the applicant approaches entry into college life.

The personal interview also gives the office of Handicapped Student Services the opportunity to have the applicant complete any of the aptitude, interest, or personality inventories which might seem appropriate for a particular individual. In addition, the applicant is given the opportunity to tour the campus in much the same manner that a student tours the campus in everyday student life. In the actual experience of coping with the physical facilities on the campus, the student can better know his functional capabilities and can discover what may be some needs which must be met before he comes on campus as a student.

After the completion of all aspects of the personal interview, the Coordinator of Handicapped Student Services, in collaboration with the Committee members makes the decision concerning the admissibility of the applicant. The applicant is notified immediately and if any agencies are bearing the responsibility of supporting the applicant financially, the agency is notified of the applicant's admission status. See Table II, page 28.

Once the individual is on the campus as a student, he is expected to maintain his functional capabilities and to be an independent member of the total student population. If the student suffers a marked increase in the severity of his disability or for some other physical reason becomes unable to cope with the physical requirements of the campus, he may be required to leave until such a time as the Special Admissions Committee determines that he may resume his course of study. In addition, students who do not succeed academically are given the same opportunities as are able-bodied students to remain at the University or to be asked to leave because of their academic standing.

3. Orientation. The beginning of each academic session finds several handicapped students beginning their college careers. In addition to the usual orientation provided for all new University students, the handicapped student

TABLE II

SPECIAL ADMISSIONS COMMITTEE ACTIVITIES

	Female	Male	Total
Reviewed	13	37	50
Rejected			25
Physical Reasons	1	7	
Academic Reasons	6	11	
Withdrew			9
Before Review	0	6	
After Review	1	2	
Accepted	7	15	22

coming to the University for the first time is asked to participate in a group orientation meeting arranged by the Coordinator of Handicapped Student Services. In the orientation meeting the handicapped student receives information about many of the day-to-day activities and services of which he should take particular note. Information concerning such things as the modified bus service, handling of VRA authorized monies, procedures for purchasing books and supplies, and the general philosophy of the handicapped student program are among the things explained and discussed at the orientation meeting for the new handicapped student.

Of particular note is the philosophy of the Handicapped Student Services which encourages the independence of each student. Experience has shown that often the person coming onto the campus has been accustomed to a very dependent existence. He has had assistance with his daily needs and with mobility. In addition, he is often from a rather restricted environment which has not given him a full exposure to the world. In an attempt to allay the problems which may naturally spring from such a background, the handicapped student is given as much information as can be supplied by the Handicapped Student Services to make his life on campus an independent experience.

Each student is provided with a complete list of accessible buildings which notes the location of ramps. elevators, and restrooms in each of the modified facilities. Each student is presented information about the problems of campus travel via wheelchair or walking, both when the campus bus is available and when it is not. These and many other problems are discussed by the students during the initial orientation meeting. The student is alerted to the problems he may face and can react to the general philosophy which would encourage him to become a participating member of the student body.

4. Counseling. Although the Handicapped Student Services attempts to provide in the personal interview and in the orientation meeting information and counseling which will enhance the adjustment of a handicapped student to his college life, there is a need to provide opportunity to the student for continuing contact with the counseling services of the office. The Handicapped Student

Services is available at all times to assist with problems which the handicapped student may encounter. The handicapped student is encouraged to utilize the resources available so as to maximize his educational progress.

The handicapped student can obtain assistance with many of the day-to-day administrative problems which occur as a result of his handicap. An example of the type of help the handicapped student might seek would be the problems of scheduling his course work in such a manner as to make his campus travel most efficient. In addition to such administrative assistance, the office of Handicapped Student Services is especially concerned that the handicapped student utilize the opportunity for help with vocational, educational, or personal problems which may develop while he is a student at the University of Missouri.

Because the Handicapped Student Services is a part of the University Testing and Counseling Service, the handicapped student is encouraged to contact the Testing and Counseling Service to seek counseling from a member of the staff of professionally trained counselors. The counselor may help him select a vocation, solve personal problems, develop more positive study habits and study skills, or map out his educational objectives. In addition, the handicapped student has the opportunity, as do all students, to use the Testing and Counseling Service to obtain psychological and educational testing to assist him in evaluating his particular needs.

Thus, the handicapped student has available to him help with the problems he may encounter. In practice, the handicapped student does frequent the office of Handicapped Student Services with many problems. Some may seem minor but all are of concern to the student. The intention of the Handicapped Student Services is to help the student with whatever problem that he may have if it is within the scope of the abilities and resources of the staff of the Testing and Counseling Service.

The experience of these beginning years of the Handicapped Student Program has revealed that handicapped students are especially concerned with various aspects of adjustment which are in some ways peculiar to their situation. Often the handicapped student may have problems with his personal attendant--either the possibility of losing the services of the attendant or having some personal conflict with the attendant. Another problem often occurring is the problem of financing his college education. Although the handicapped student is encouraged to be as independent as possible, experience has shown that inadequate financial planning or a misunderstanding of his financial arrangements can cause a handicapped student much concern.

Problems such as the aforementioned and others such as the indefiniteness of vocational objective are encountered frequently. The office of the Handicapped Student Services, in conjunction with the Testing and Counseling Service attempts to help the handicapped student resolve these problems so that the handicapped student can succeed at the University of Missouri.

Table III (page 32) lists the number of counseling contacts from June, 1965 to June, 1966. The total number of contacts represents the counseling activities described in the preceeding paragraphs plus the separate contacts with parents of handicapped students. Although parents of handicapped students generally live too far away for more than one or two counseling contacts, the office of Handicapped Student Services attempts to work with the parents in any way possible to facilitate the adjustment of the handicapped student.

5. Special Assistance. In addition to the counseling services and the assistance with day-to-day administrative problems, the office of Handicapped Student Services provides assistance with special problems of some of the students.

Specifically, the severely handicapped student often has some functional loss in either speech, hearing, sight, or use of the hands. Students with such functional loss require some assistance with their communication in the academic setting.

The office of Handicapped Student Services will make available to the student the opportunity to take his examination under the proctorship of the Psychometrist of the Testing and Counseling Service. All that the student need

TABLE III

COUNSELING ACTIVITIES

JUNE, 1965 - JUNE, 1966

Counseling Contacts - Students	238
Counseling Contacts - Parents	32
Total	270

do to use this service is to make the necessary arrangements with his instructor and keep the office of Handicapped Student Services aware of his intentions. In addition, a student who needs special equipment, i.e., dictating machine, or typewriter, may use the equipment provided by the Handicapped Student Services. A typewriter and tape recorder are available in private study rooms in the General Library for the use by the handicapped student.

Consultant to the Campus

Provision of services to the handicapped student extends beyond the direct relationship with the handicapped student. The office of Handicapped Student Services represents the needs of the handicapped students to offices and committees of the University of Missouri. The Coordinator of Handicapped Student Services serves as a consultant to those offices or committees who may be planning programs which will involve the handicapped students. He works closely with the planning of new buildings and remodeling so that all facilities can be accessible to the handicapped. In addition, he works closely with the student personnel offices which have frequent contact with the handicapped student.

1. Architectural Access. A campus the size of the University of Missouri necessitates considerable planning of its physical plant. Many offices and committees are, at one time or another, developing plans for new facilities or for modification of old facilities across the campus. As these committees develop their plans for facilities, the office of Handicapped Student Services, in cooperation with the Physical Plant and the campus architects, is available to consult with the committees about the necessary requirements to make a facility accessible to a handicapped student.

Although the Coordinator of Handicapped Student Services is not expected to be particularly knowledgeable about architectural specifications, the consulting role does provide the various planning groups a contact point to help understand the requirements for accessibility. In addition, the consulting role of the office of Handicapped Student Services places a responsibility on the office to insure that new buildings and remodeled buildings meet the requirements of the ruling of the Board of Curators of the University of Missouri which requires that all new buildings include facilities for the handicapped.

Consultation with committees planning major remodeling or new buildings is only one of the necessary consulting functions relating to the physical facility. It is very important that the Coordinator of Handicapped Student Services act as liaison between the students and the Physical Plant. Experience has shown that students in their day-to-day activities observe many problems which, if corrected, might make for better functioning on the campus. The students can bring these problems to the attention of the Coordinator, and he can consult with the superintendent of the Physical Plant and help in deciding on priorities and essential modifications.

Examples of problems which students have brought to the attention of the Coordinator and which have been corrected through consultation with the Physical Plant are such things as: deteriorating sidewalks, doors that are sticking, need for additional curb cutdown, the need for replacement of a shower seat in the dormitory, and other seemingly insignificant problems which, if corrected, can make the student's life easier. In addition, consultation with the Physical Plant on an issue such as priority of snow removal, can result in a spirit of cooperation in the students and the Physical Plant which is very desirable.

The office of Handicapped Student Services also works closely with the supervisor of the Physical Plant in order to estimate future needs so that priorities can be established and future budgets planned.

Personnel Services (under Consulting)

The administrative practices of many University services which function under the broad category of Student Personnel Services often include consideration for the handicapped student. In addition to the coordination of procedures previously described in this chapter, the office of Handicapped Student Services provides consultation with Student Personnel Services in order to serve the needs of handicapped students.

The establishment of the consulting role in relation to the Personnel Services rather than attempting to provide all of the services in one office exemplifies the philosophy of the handicapped student program at the University of Missouri. A consulting role allows utilization of the expertise already developed by the specialists in various services. Further, duplication of existing services is minimized and the handicapped student is included in the mainstream of student life. Except for those occasional situations where special information is needed, or special services are required, the handicapped student can be served by the Student Personnel Services as fully as are the able-bodied students.

In the following pages, each of the Student Personnel Services will be described as they relate to the handicapped student and to the consulting role of the office of Handicapped Student Services.

1. Admissions. Early in the development of the handicapped student program, consultation with the Admissions Office resulted in a change of the regular admission application form. The revision in the application blank which is sent to all students requesting admission to the University consisted of one brief question. The question is: Do you consider yourself physically handicapped? If yes, explain briefly.

The one question and the accompanying space for explanation allows the Admissions Office to quickly determine whether an applicant is handicapped and if so, the application can be sent immediately to the office of Handicapped Student Services. The Coordinator for Handicapped Student Services, in cooperation with the Director of Student Health Services, attempts to determine if the applicant can be classified as severely handicapped and if so, the application will be processed through the procedure for admitting handicapped students. If, on the contrary, the handicap indicated does not seem to be severe, the application will be returned to the Admissions Office and the person may be admitted through regular admission procedures.

Another aspect of the cooperation with the Admissions Office is the admission of graduate students. Because a graduate student must obtain consent from a department to undertake his advisement, the Admissions Office normally verifies the willingness of a department to undertake said advisement. Through consultation with the Admissions Office, no change has been necessary in this procedure and the respective academic departments continue to follow routine procedure.

2. Registrar. One of the most important aspects of the life of the handicapped student is the necessity that his schedule of courses be compatible with his functional ability. In the arrangement for such compatibility, consultation with the Registrar's Office has been invaluable.

The complexity of the University of Missouri and the problems of mobility for the handicapped student require that he schedule his time in a very precise manner. Experience has shown that the handicapped student cannot often move from one class to another in the ten minutes scheduled between class periods. However, handicapped students are in the same curriculums as are the able-bodied and must complete the same required course work. Therefore, a schedule of courses which considers both accessibility of buildings and the time requirements for moving from one place to another is essential.

Consultation with the Registrar's Office has resulted in an arrangement whereby the book containing the schedule of courses for a particular semester indicates those courses not accessible to students confined to wheelchairs. In the preparation of a student's schedule, the student and his academic adviser can use the information in the schedule book to completely plan the schedule without the assistance of the office of Handicapped Student Services. Again, the consultation resulted in an opportunity for the handicapped student to experience the independence required of an able-bodied student.

In actual practice the ideal schedule is not always available to the handicapped student. Complications concerning a sequence of courses, courses closed before the handicapped student files his registration, or other circumstances which preclude the most desirable schedule requires further consultation with the Registrar's Office to help the handicapped student make the best arrangements possible. Utilizing the central scheduling system of the Registrar's Office, the Coordinator of Handicapped Student Services can discuss the problem with the Registrar and the student and, in most cases, determine a satisfactory solution. Thus, the academic routine for the handicapped student is facilitated and the close cooperation between the Registrar's Office and the Handicapped Student Services allows the usual flow of registration procedures without noticeable disruption.

An additional aspect of the consultation role with the central scheduling service is the development of data processing procedures which will provide periodic updated surveys of all accessible buildings and rooms on the campus.

3. Cashier's Office. One of the major concerns of all college students is money. The handicapped student is no exception. As a matter of fact, the handicapped student often has to deal with a more complicated set of financial arrangements than does the able-bodied.

A very typical situation is one wherein the handicapped student is receiving a portion of his college expenses from a sponsoring agency such as Vocational Rehabilitation, and is at the same time receiving help from his parents, receiving scholarship money, obtaining loans, or perhaps even working part-time. Thus, the student has a responsibility to know his financial responsibilities and how best to handle the obligations incurred as a student.

Consultation with the Cashier's Office has made it possible for the handicapped student to deal directly with a member of the Cashier's staff to permit better control of the financial arrangements. The Cashier's Office receives all correspondence regarding authorizations from agencies. The authorizations often range from payment of incidental fees only, to authorizations which provide full support for the student, including personal maintenance. The Cashier's Office will compare the authorization to the fees required of the student and work with the student in arranging for payment of all obligations. Thus, the payment of incidental fees, out-of-state tuition, room and board, or the modified bus service can be handled efficiently. In addition, the Cashier's Office will act as coordinator between the student and the various agencies if the student is to receive additional monies for personal maintenance.

The close cooperation between the office of Handicapped Student Services and the Cashier's Office has proven to be an advantageous relationship in helping students to better understand their financial problems.

4. Housing. It would appear that the majority of handicapped students woul prefer not to be placed in a living unit which is over-populated with other handicapped students. Consultation with the Housing Office of the University of Missouri has established a general policy which calls for a maximum ratio of one handicapped student for each five able-bodied students in a particular housing unit.

The purposes for such an arrangement are twofold. First, to prevent the physical congestion of the hallways. Students in wheelchairs in the corridors impede the flow of traffic and may give the able-bodied students the impression that their house is mostly handicapped. Secondly, the ratio permits the usual intra-mural sports, social activities and student government to be maintained in a particular housing unit rather than having a special government and special activities only for the handicapped. Indeed, experience has revealed that the one to five maximum ratio has worked very satisfactorily and the handicapped students have been able to enter into the activities of their houses.

Another important aspect of the consultation with the Housing Office is the assignment of handicapped students to rooms. The Housing Office often has no more information on the application for housing than an indication that the student is handicapped. Through consultation with the Coordinator of Handicappe Student Services, the Housing Office can determine the extent of the student's handicap and the nature of his room requirements. Such questions as: "Will he need an attendant?" "Is he in a wheelchair?" "Does he need a single room?" can be answered. The additional information about the student permits the Housing Office to maintain their wish not to have two handicapped students in the same room and they can maintain their desire to provide for the handicapped student the arrangements necessary to promote adequate functioning. Upon the request of the handicapped student, the Housing Office will make arrangements for an attendant to move into the room with the handicapped student.

Further, through consultation with the Housing Office, including the head residents, personnel assistants, and resident advisers, the Coordinator of Handicapped Student Services can be available to answer questions about the handicapped student population and to promote an understanding among the staff members and the students of problems which may arise.

The continued cooperation of the Housing Office has made it possible for handicapped students to function quite adequately in their living environment at the University of Missouri. The cost for room and board at the University residence halls is the same for the handicapped student as it is for the able-bodied even though they may actually require additional space. In addition, consideration is given in placing the handicapped student in a particular room so as to allow him the best advantages in consideration of his particular handicap. For example, a person with restricted movement on crutches would generally be located closer to a restroom than someone in a wheelchair who could travel a greater distance without incurring too much fatigue. He would also usually be placed in a room which is a minimum distance from the loading zone of the modified bus.

However, the basic philosophy of the arrangements for housing is that the handicapped student must maintain the responsibilities of a resident the same as the able-bodied student.

5. Student Health Service. The usual services of the Student Health Service are available to the handicapped student. The policy of the Student Health Service at the University of Missouri includes the following regulations:

(a) All students, regardless of the number of credit hours taken, will be entitled to similar Health Services benefits, including infirmary care.

(b) The Health Service will provide services only at the Student Health Center. This will include any consultations requested by the Student

Health Center.

(c) The cost of medical care elsewhere than the Student Health Center will be the responsibility of the student. In order to assist the student and meet the cost of this medical care, the University makes available a supplementary accident and sickness insurance policy.

The provisions of the Student Health Service policy make it possible for the handicapped student, as well as the able-bodied student, to avail himself of the treatment available at the Student Health Service. When the condition of the student becomes chronic, the Student Health Service determines whether the services required of the chronic condition can be performed within the confines of the Student Health Service. If they cannot, the student is referred to an outside medical facility. The student must assume the responsibility of payment for these additional services. Often a handicapped student is sponsored by an agency such as Vocational Rehabilitation and the additional medical services may be a part of his rehabilitation plan.

As a result of having handicapped students on campus, we did find it necessary to greatly enlarge our established Physical Therapy Unit in the Student Health Service. The services provided by this unit will be explained in detail later in the report.

When called upon, the office of Handicapped Student Services can act as liaison between the student and his Vocational Rehabilitation counselor in order to obtain the services necessary as a result of recommendations from the Student Health Service. In addition, close cooperation with the Student Health Service allows the Handicapped Student office to know when the condition of a student may be so chronic as to be severely impairing his academic progress. Such consultation can allow the Coordinator of Handicapped Student Services to assist with arrangements necessary to maintain the student in good standing at the University.

6. Other Personnel Services. Under the general heading of Personnel Services available to the student at the University of Missouri are other offices

with which the handicapped student has only occasional contact. However, from time to time, issues are raised which allows the office of Handicapped Student Services to consult with the office concerned.

The Traffic Safety Office often receives requests from handicapped students to use an automobile on campus rather than the modified bus. Consultation with the office of Handicapped Students helps the Traffic Safety Office to understand the problems of the student and to make the decision concerning the automobile. Regulations concerning automobiles on the University of Missouri campus are very important in the control of traffic and because of the extremely limited amount of parking space. However, if the Traffic Safety Office, in consultation with the office of Handicapped Student Services determines that the handicapped student does need an automobile, the student can purchase a permit which will allow him to park in faculty and staff parking lots. It remains the responsibility of the handicapped student to adhere to the driving and parking regulations of the campus.

Another office which occasionally is involved with the handicapped student is the office of the Coordinator of Safety for the campus. The Coordinator of Safety is concerned for the safety of the handicapped student but must remain concerned for the safety of all able-bodied students as well. Therefore, consultation with the Safety Coordinator, the Physical Plant and the University planning committees has, from the very beginning of the handicapped student program, been important to determine whether proposed modifications meet the regular safety specifications of the campus. Since there are many old buildings on the Columbia campus, the matter of safety considerations for students who are restricted to wheelchairs has been given considerable attention. In cooperation with the Coordinator of Safety, an evacuation and campus disaster plan has been established.

Two other offices are often in contact with the handicapped student. They are the Dean of Students office and the Director of the Student Union. Handicapped students need to engage fully in campus activities just as do the able-bodied students. Therefore, the activities program coordinated by the Dean of Students office and the recreational facilities provided by the Student Union consider the needs of the handicapped student in his desire to be a functioning member of the college population.

In addition, the handicapped student is subject to the disciplinary procedures which are a part of the function of the Dean of Students office. A handicapped student receives no special privileges which might relieve him of his duty to be a responsible citizen while in college.

Academic Departments

Consultation with the faculty and administration of academic departments is a very important part of the handicapped student program. Even when the original plans to modify the University were being formed, we recognized that the academic personnel would frequently be in contact with the handicapped student. Accordingly, we initiated regular contact with all academic departments to attempt to keep them informed of the activities and needs of the handicapped student.

The office of Handicapped Student Services provides to each academic division a list of all handicapped students on campus. The list permits the faculty members to identify handicapped students in their division who might need special advisement with their plans for a particular curriculum, and it helps the faculty member to be aware of the academic progress of the handicapped student. If the academic department notes that the handicapped student has an academic or functional problem, consultation with the office of Handicapped Student Services may be a very vital step in assisting the student to maintain his primary goal, i.e., securing an education. Further, continuous contact with the academic departments allows the faculty to arrange for special physical considerations which might become necessary because of the student's particular disability.

The office of Handicapped Student Services can help the faculty member understand the extent of a student's problem with communication, handwriting or other physical aspects directly relating to his role as a student. For example, the blind or partially sighted student needs to have blackboard notations repeated verbally. The student with a hearing loss may need to sit in the front row. The student with a handwriting loss may need to make arrangements for class notes from a classmate and finally, a student with a communications problem, a vision problem, or a handwriting problem may need to make special arrangements for taking the required examinations. The office of Handicapped Student Services stands willing to proctor examinations in the testing room of the Testing and Counseling Service.

Physical Education

Just as the life of an able-bodied student is not all within the academic classroom, the handicapped student must have an opportunity for other learning experiences. Consultation with the Physical Education Department has resulted in development of a modified physical education program. To implement the requirements of a modified program, special exercise equipment was purchased with grant monies to supplement the equipment available in the Physical Education Department.

Each handicapped student is evaluated and participates in a plan of physical education commensurate with his physical capabilities. The extent of participation might range from a regular physical therapy program to participation in a sport available to able-bodied students as well.

PHYSICAL THERAPY

In addition to the services of the office of Handicapped Student Services, the Physical Therapy Unit of the Student Health Service provides an essential and important service to the handicapped students. For the handicapped student at the University of Missouri, the problem of maintenance of his physical condition is one of the most important problems he has to face. The Physical Therapy Unit can provide the handicapped student maintenance therapy and it can also train the handicapped student to successfully perform the physical movements necessary for mobility on the campus.

From the date of the initial contact with the student during the personal interview, the Physical Therapy Unit is concerned that the handicapped student adapt to the physical demands of the Columbia campus. The staff of the Student Health Service reviews the medical history of the student and evaluates his functional capability. Physical therapists advise the student on questions about wheelchairs, prosthesis, etc. The physical therapists can help the handicapped student to secure repairs or to investigate the possibility of obtaining new equipment.

The Physical Therapy Unit has developed a popular and well used program of services. Currently, a daily average of from 5 to 6 handicapped students receive physical therapy. The handicapped student, although not given preferential treatment over the non-handicapped student in need of physical therapy, uses the physical therapy service much more often and for longer periods of time than do the non-disabled students. The handicapped students on the campus of the University of Missouri have available to them a physical facility which provides them with an opportunity to maintain their physical functioning capacity at a level which will allow them to continue in school. The services of the Physical Therapy Unit are available to handicapped students. In specific cases, they are required to participate in physical therapy on the instructions of their physician. Many other handicapped students are not required to make use of the services but do so on a regular basis in order to improve physical functions. Consistent with our overall philosophy, students are urged to make use of the services but are not forced to do so.

SPEECH AND HEARING

Another service of the University of Missouri which is available to the handicapped student is the evaluation of speech and hearing through the Speech an Hearing Clinic maintained by the University's Department of Speech.

As a part of the enrollment procedure for handicapped students, each handicapped student is required to complete the speech and hearing evaluation. The recommendation of the clinic gives the student information about his ability to communicate effectively in classrooms and on campus and suggests to the students any remedial measures which might help. Thorough evaluation may result in a recommendation for speech therapy, auditory training or a referral for medical diagnosis of a problem with speech or hearing.

OTHER SERVICES

Clearly implied in the descriptions of the services described thus far is the assumption that the student can avail himself of established services. Therefore, provision for modified bus service has been included in the handicapped student program at the University of Missouri. Currently, two modified buses operate on the campus to provide transportation from dormitories to classes and to other activities. More than half of the handicapped students make use of these buses daily.

The schedule of the bus allows the handicapped student time to get from the dormitory and into the classroom at the regular scheduled time. In addition, the bus runs within the campus to transport students from class to class throughout the day. Included also in the operation of the modified bus service is a provision to transport the students to events on campus during the evening hours and to home football games during the football season.

Each of the modified buses has special interior modifications which allow students in wheelchairs and other handicapped students to ride safely. A hydraulic lift is built into each bus so that the wheelchair student can be lifted aboard or exited. Appendix C provides specifications of the modified buses.

Another service available to the handicapped student is provided in the University library. Handicapped students must use the materials of the University library to fulfill course requirements or to do individual research. The University library has made available for the use of handicapped students two private rooms. An electric typewriter, a dictating machine and a tape recorder have been placed in the rooms by the handicapped student program for the use of handicapped students as they use the resources of the library. Handicapped students may use the private rooms if they will request the key from the main circulation desk of the library.

Another aid for blind students which has been placed in the library is a block model of the complete campus. Blind students can become familiar with the locations of buildings and streets by touching the model and getting a feel for the geography of the campus.

The outstanding cooperation of the library staff has made the University library easily accessible to the handicapped student. The library staff stands ready to provide help with obtaining books from the stacks, providing assistance in the card catalog or in the micro-film library. The services available to the handicapped student in the library are sufficient to allow him to complete necessary assignments within the same expectations which are placed on the able-bodied student.

CHAPTER IV

THE FUNCTIONING PROGRAM, RECOMMENDATIONS, AND THE FUTURE

At the time of the writing of this report, the Handicapped Student Services at the University of Missouri is an ongoing, growing program devoted to the education of the handicapped student. This unit of the report will attempt to briefly explain the current handicapped student program at the University of Missouri, propose recommendations for the development of Handicapped Student Services on other campuses as well as for improvement of the services at the University of Missouri.

THE STUDENT BODY

The handicapped student program at the University of Missouri has grown consistently since the fall of 1962 when eight students were enrolled to the current enrollment of over fifty severely handicapped students.

The students enroll in almost every department of the University of Missouri in both undergraduate and graduate curriculums. Since the beginning of the handicapped student program, 17 students have received Bachelor's degrees and a number of students have continued their studies in Graduate School at the University of Missouri. As would be expected for any group of students, a number of handicapped students have withdrawn from the University. The percentage of students enrolled in the handicapped student program who have withdrawn from the University has been basically the same as the non-handicapped students. Some have left because they cannot meet the academic demands of the University of Missouri, while others are forced to leave because they cannot adjust to the academic atmosphere of a campus or do not have sufficient motivation to cope with an academic situation which demands independence. In addition, students leave for medical reasons and a few leave for miscellaneous, non-academic, reasons.

About 50% of the handicapped students at the University of Missouri are from the State of Missouri. Thirty percent are from the other states of HEW Region VI and the remaining 20% come from states or countries outside of Region

VI. Table I indicates the states and countries from which prospective students had corresponded with the office of Handicapped Student Services during the 1966-67 academic year.

Enrollment figures of the severely handicapped student do not totally reflect the number of handicapped who are now able to utilize the campus. Many students are on campus who have handicaps of a less severe nature, but who are greatly aided by the modifications on the campus. In addition, the University of Missouri sits adjacent to a vast medical complex which treats many handicapped out-patients. Those people can be better served by the medical facility because the campus has been modified.

Academic Performance

Results of a recent statistical study by the office of Handicapped Student Services, in cooperation with the Testing and Counseling Service, indicated that the performance of handicapped students in high school, on the School and College Ability Test, and during their first semester at the University of Missouri is not significantly different from the performance of able-bodied students. Only on the verbal section of the SCAT did the handicapped student differ significantly in the study, and, in that instance, the handicapped male student performed at a significantly higher level than the able-bodied male student.

All handicapped students are required to meet the same academic requirements as other University students. Since the program was designed to allow academically talented, physically handicapped students to pursue higher learning, the desire of the handicapped student program is that all handicapped students benefit from their experience at the University of Missouri. The emphasis on independence places responsibility for academic performance directly upon each handicapped student and a variety of results have been observed. At the present time, predictions of academic success are unavailable due to the small amount of data collected to date.

Social Performance

As is seen with respect to academic achievement, social performance of the handicapped student varies from individual to individual. The University of Missouri attempts to provide handicapped students with the same freedoms and responsibilities as able-bodied students. The handicapped students are active participants in the extra-curricular activities on the campus.

A handicapped girl has been president of her house; other students have been senators in the Missouri Students Association; and many others participate in student organizations. The independence of the handicapped student enables him to interact with other students on the basis of common interests. They participate in activities and hold offices on the strength of their abilities and interests. They live in a world that isn't handicapped and have the opportunity to be classified on the basis of their skills and personality rather than on the basis of their physical characteristics. The extent to which a handicapped student participates is entirely up to the individual student.

PRESENT FACILITIES AND ADMINISTRATION

1. OFFICE FOR HANDICAPPED STUDENT SERVICES. As the handicapped student program has developed, the office of Handicapped Student Services has required office space accessible to the handicapped student.

At the present time, the office of Handicapped Student Services is located in 21 Parker Hall, the building which houses the Testing and Counseling Services and the Speech and Hearing Clinic. The building is accessible to all students.

The office was furnished with grant monies and includes two private offices for counseling which are equipped with desks, chairs, bookcases, and dictating machines. In addition, a reception room is provided for the Secretary of the Handicapped Student Services. The grant equipped the reception room with the necessary typewriters, filing cabinets, desks, etc.

The current staff of the Handicapped Student Services includes the Coordinator of Handicapped Student Services, a full-time secretary, a half-time graduate student as counselor and a part-time student helper. The Coordinator is responsible for the daily operation of the Handicapped Student Services. In addition, the Director of the Vocational Rehabilitation Counselor Training Program and the Research Director of the Regional Rehabilitation Research Institute are special consultants to the Handicapped Student Office. The Director of the Vocational Rehabilitation Counselor Training Program is an Assistant Director of the Testing and Counseling Service with direct responsibility for the handicapped student program.

2. PHYSICAL THERAPY. The Physical Therapy Unit occupies the entire fourth floor of the hospital wing of the Student Health Service. A major portion of the Physical Therapy Unit is used for the physical therapy equipment. In addition, private rooms are used for specialized therapy equipment. The unit includes an office for the therapist and a waiting room.

The personnel staffing the Physical Therapy Unit consists of one full-time physical therapist, one full-time aide, two half-time student helpers, and three half-time physical therapy students. One physician is available as a consultant. The physical therapist consults with the physician to determine the specific physical therapy program which the handicapped student needs.

RECOMMENDATIONS -- THE FUTURE

The experience of the University of Missouri in developing a comprehensive program for handicapped students has provided some enlightening experiences and some valuable information. We hope that colleges or universities planning a program for handicapped students can profit from what has been learned during the development of the handicapped student program here at the University of Missouri. A program designed to serve the handicapped student will, by its very nature, require attention to many details.

The modification of the physical plant is but one of the areas of concern as a program is developed. The financial arrangements necessary to modify the physical plant require attention to a vast amount of detail and require the utmost attention to planning and preparation.

The requirements of the supporting services are also very important. The coordination of all of the main offices which may have contact with the handicapped student is a job which requires a thorough knowledge of the philosophy of the college and the objectives of its operation. The handicapped student program should be a part of the basic structure of the university so that the handicapped student can be an independent member of the student body but at the same time have available to him the special services that he needs. Exactly how this attitude on the part of both student and the university community is to be developed will vary from institution to institution and will be largely dependent upon the personnel who are involved with the program.

The future of the handicapped student program at the University of Missouri will, in many ways, also be a function of the personnel involved with the on-going services available to handicapped students. The physical plant is now quite accessible; therefore the emphasis in the future will be on coordination and consultation rather than providing accessibility. As the academic community becomes more aware of the handicapped student on the campus, the integration of the student into the total educational program will be the desire of those working with the handicapped student.

In order to better understand what is happening at the present and to prepare for the future, the Handicapped Student Services is attempting to develop an on-going program of research which will, hopefully, reveal information which will be valuable in providing services to the handicapped. At the present time the Office of Handicapped Student Services is maintaining a comprehensive program for collection of demographic data on each handicapped student and as much information on those who apply as is possible to obtain. An example of some of the demographic data is provided in Table I and in Table IV.

In addition to the studies which can result from demographic data, the Handicapped Student Office has developed a test of handwriting speed designed to provide an objective estimate of the students handwriting ability. The test proves useful in assisting a professor to determine what increase in testing time might be appropriate for a handicapped student who has a physical hand-

TABLE IV

SUMMARY OF STUDENTS

1965 - 66 Academic Year

	Canada	Alabama	Colorado	Indiana	Iowa*	Missouri*	Nebraska*	New York	N. Dakota*	Ohio	S. Dakota*	Wisconsin			Total Number	% of Total
Female	1			2	3	11	1		1	1					20	42
Male		1	1	1	7	14	1	1			1	1			28	58
Personal Att.				2	2	5	1	1		1	1				13	27
w/chair	1	1	1	3	4	13	2	1	1	1	1				29	60
VRA sponsored	1	1	1	2	8	24	2		1		1				41	85
Univ. Division																
A & S			1	1	4	10	1		1		1				19	40
Educ.				1	2	6	1								10	21
Grad.				1	2	2				1		1			7	15
Home Ec.						1		1							2	4
B & PA	1				2	4									7	15
Engr.		1				2									3	6
Total Handicapped Students	1	1	1	3	10	25	2	1	1	1	1	1			48	

*State in Health, Education and Welfare Region VI writing loss.

Other areas of research which are being investigated as on-going projects include assessment of academic performance and attempts to determine other criteria which seem to be predictive of success as a college student. A recent study compared aspects of prediction of academic performance of handicapped students to those being used at the University of Missouri for able-bodied students. Table V presents data on the predictor variables for able-bodied and handicapped students. Table VI indicates correlations with grade point average of the various predictors for the handicapped student.

The research plans mentioned in the preceding paragraphs and others which may be developed will be emphasized in the coming years in order to develop the handicapped student program into one that can better serve the handicapped student in the academic community.

TABLE V: T-SCORE MEANS AND

STANDARD DEVIATIONS OF ABLE-BODIED

AND HANDICAPPED FRESHMEN AT THE UNIVERSITY OF MISSOURI

		1st Sem. GPA		SCAT Verbal		SCAT Quant.		SCAT Total		HSR	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Female	Able-bodied	2.28	.84	52.6	9.9	49.9	10.1	51.5	10.2	53.6	9.2
	Handicapped	2.27	.62	51.06	14.35	49.59	13.54	50.94	13.80	53.35	9.92
Male	Able-bodied	1.90	.85	*49.9	9.5	*53.4	9.6	51.8	9.6	48.1	9.6
	Handicapped	1.92	.95	53.41	9.78	50.09	9.23	52.34	10.38	48.62	8.37
Total	Handicapped	2.04	.73	52.59	11.62	49.92	10.98	51.86	11.69	50.27	9.20

* Results of 't' test revealed significant difference beyond the .05 level of significance

(Ho: $\bar{X}_{Ab} = \bar{X}_{Hand}$)

TABLE VI: ZERO ORDER CORRELATIONS
AND SELECTED MULTIPLE CORRELATION WITH
FIRST SEMESTER GPA: HANDICAPPED STUDENTS

		ZERO ORDER				MULTIPLE			
		SCAT							
	N	Verbal	Quant.	Total	HSR	Total HSR	Verbal HSR	Quant. HSR	Verbal Quant.
Female	17	.686	.623	.688	.394	.698	.697	.645	.717
Male	32	.577	.644	.701	.331	.703	.500	.708	.697
TOTAL	49	.536	.574	.613	.371	.634	.564	.582	.612

CHAPTER V

THE PROJECT IN REVIEW

The establishment of facilities and the initiation or expansion of personnel services which made it possible for severely handicapped students to attend the University of Missouri, Columbia, began with the approval of a planning grant for the period December 1, 1959, through August 31, 1960. The money was made available by the Vocational Rehabilitation Administration (VRA) to the College of Education, University of Missouri to study:

1. The need for the establishment of a special university facility within this region.
2. Curriculum requirements and job opportunities for college students with severe handicaps.
3. Required special modification of existing university facilities and services.
4. The need for the establishment of entirely new facilities and services.

The results of these reports substantiated the need for the establishment of a special regional university training facility. In addition, the data provided information regarding the academic needs of the students and allowed the University to establish a schedule for building modifications. Having established that many severely handicapped students with college potential were not being rehabilitated in the number suggested by the data or at a level commensurate with their ability, the University then applied to VRA for a grant to finance the modifications necessary to make the campus accessible.

The purpose of the project was to modify the facilities, and organize the services of the University of Missouri so that severely handicapped students of college ability in this region would be able to attend the University and receive a college education. It was determined that upon completion of the project, academically qualified severely handicapped students in Region VI would be able to receive a college education commensurate with their abilities in the field of their choice, and in a setting providing them with optimum opportunity for independence and growth. The establishment of such a regional facility seemed to offer the most appropriate solution to the rehabilitation of any significant number of severely handicapped students.

The project goal was the establishment of a special regional university training facility. The facility was to serve the needs of the seven states that constitute H.E.W. Region VI. The project was also to serve as a demonstration project for other regions to demonstrate how such modified facilities could be established on other selected campuses throughout the United States. Data on the total cost of the project, architectural recommendations and construction plans, organizational structure within a university, medical services, physical education facilities, etc., were to be made available in progress reports as well as in a final (the present) report.

The total costs over the six years of the grant were approximately $980,642. Vocational Rehabilitation Administration monies of approximately $656,088 were matched with $324,554 in University of Missouri funds.

The three major factors involved in this project were: (1) the modification of the physical facilities of the University; (2) the organization and coordination of services currently available; and (3) the creation of new services and facilities.

The *American Standards Specifications for Making Buildings and Facilities Accessible to, and Usable by, the Physically Handicapped* were used in all modifications. They provided the most complete and comprehensive specifications needed for the extensive remodeling project undertaken.

Modification and construction funds totaling almost $539,089 were expended to provide 15 elevators (approximately $335,000); over 35 ramps (approximately $78,000); 20 modified doorways (approximately $15,5000); 50 modified restrooms (approximately $10,000); and over 45 cut down curbs (approximately $100-$275 each). Additional modifications for various site work, new sidewalks, minor ramps and bus loading zones accounted for the remainder of the construction monies. In each case permanent modifications were made using reinforced concrete.

The organization and coordination services currently available at the

University of Missouri were developed within the context of the total personnel program of the University of Missouri. The project coordinator provided consultation to existing services on the campus to help those services better understand the implications of the handicapped student program in the University. The various personnel services and the total academic community were thus allowed to maintain their autonomy; resulting in a spirit of cooperation among all aspects of the University. In every way possible and practical the provision of new services or abrogation of existing services was held to a minimum.

However, consultative arrangements with the student personnel services and the academic community did reveal the need to develop several new units to facilitate work with the handicapped students. Essential new services and facilities created were the office of Handicapped Student Services in the Testing and Counseling Service and an expanded Physical Therapy Unit in the Student Health Service.

The role of the coordinator which has been outlined previously in this report, became the primary service of the Handicapped Student Services. The coordinator serves in an administrative capacity to facilitate the education of handicapped students throughout their college careers and to afford maximum opportunity for their educational progress. The functions of the coordinator began with campus planning to remove architectural barriers and have evolved to include liaison and consultation with academic and personnel services and a close working relationship with the handicapped students while they are at the University of Missouri.

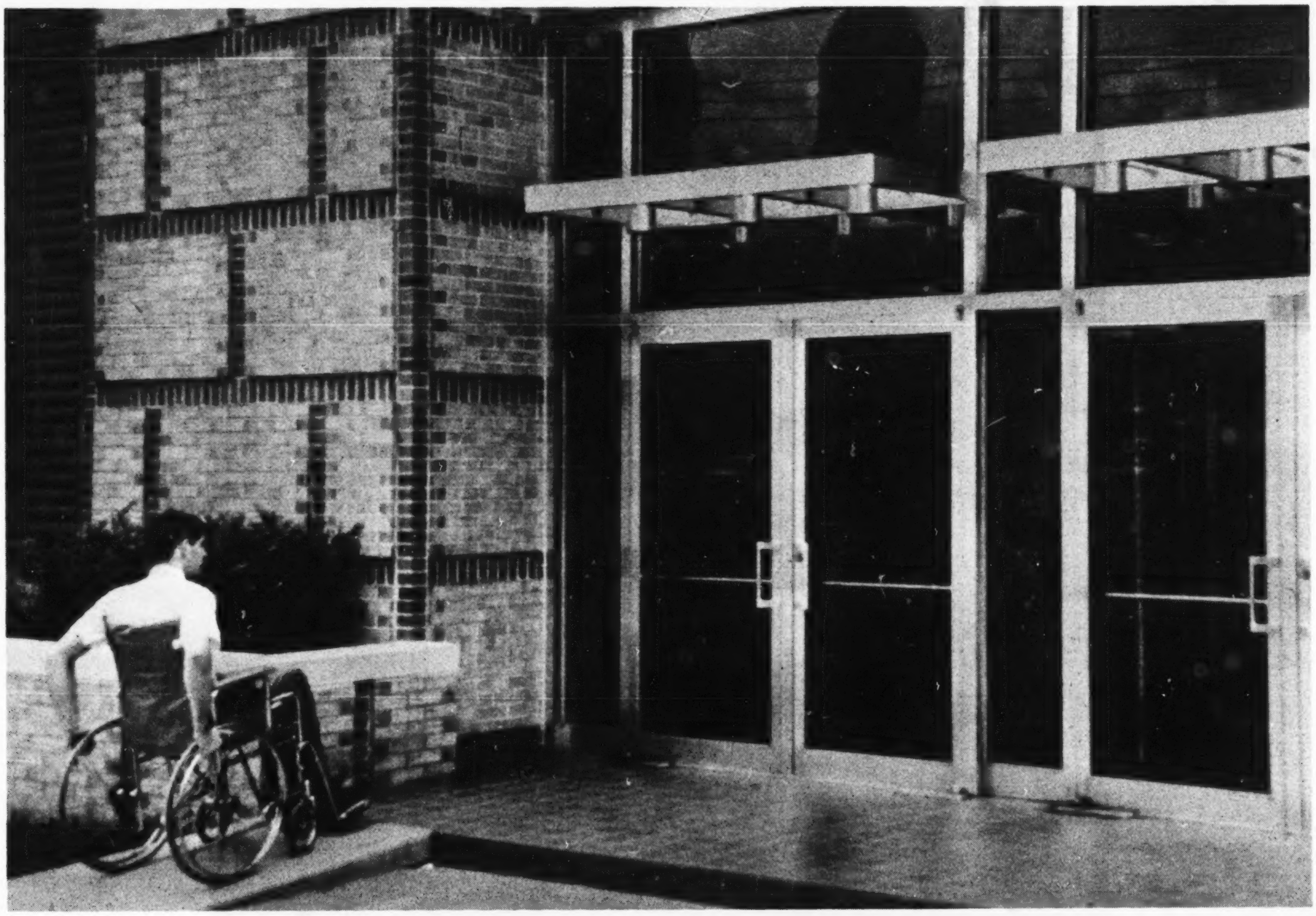
The coordinator has a responsibility to maintain an awareness of the needs of the campus regarding accessibility and the constant need for both evaluation and upgrading of services offered. In addition, a continuing emphasis on the orientation of the total campus to the implications of the handicapped student program is a very important responsibility. Faculty and new students are provided with information which will enable them to better understand the handicapped students and the function and the role of the Handicapped Student Office in the Testing and Counseling Service.

Today, more than eight years after the original application for a planning grant, it is very possible for a handicapped individual to pursue a college education at the University of Missouri. Evidenced by the numbers that are now attending and that have graduated, the University of Missouri is accessible architecturally and is providing the services necessary to assist the handicapped student with his particular needs while on the campus. The numbers of inquiries and applications increase each year. Rehabilitation agencies across the country now have the opportunity to support the education of clients that have college potential but which have previously been unable to pursue a college education because of the limited number college facilities accessible.

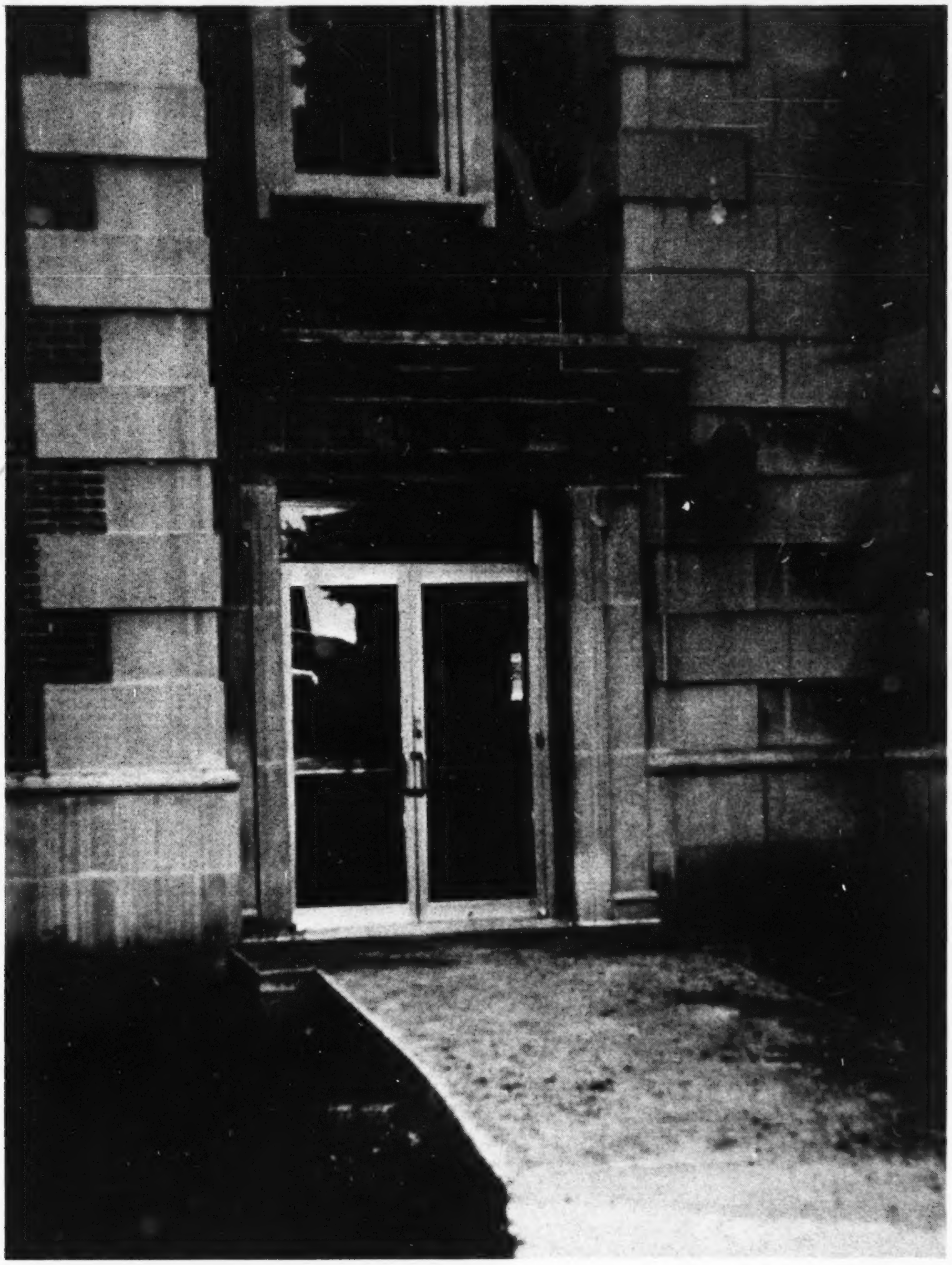
In the future we will see more and more handicapped individuals applying for admission and then obtaining a degree at the University of Missouri. The handicapped student program will be involved with the continuing up-dating of the services available and a continuing emphasis on making an education available to the handicapped. The Board of Curators of the University of Missouri has agreed in formal action to continue support for programs which will enhance the opportunities for the handicapped at the University of Missouri.

PHOTOGRAPHS OF MODIFICATIONS
ON THE
UNIVERSITY OF MISSOURI CAMPUS

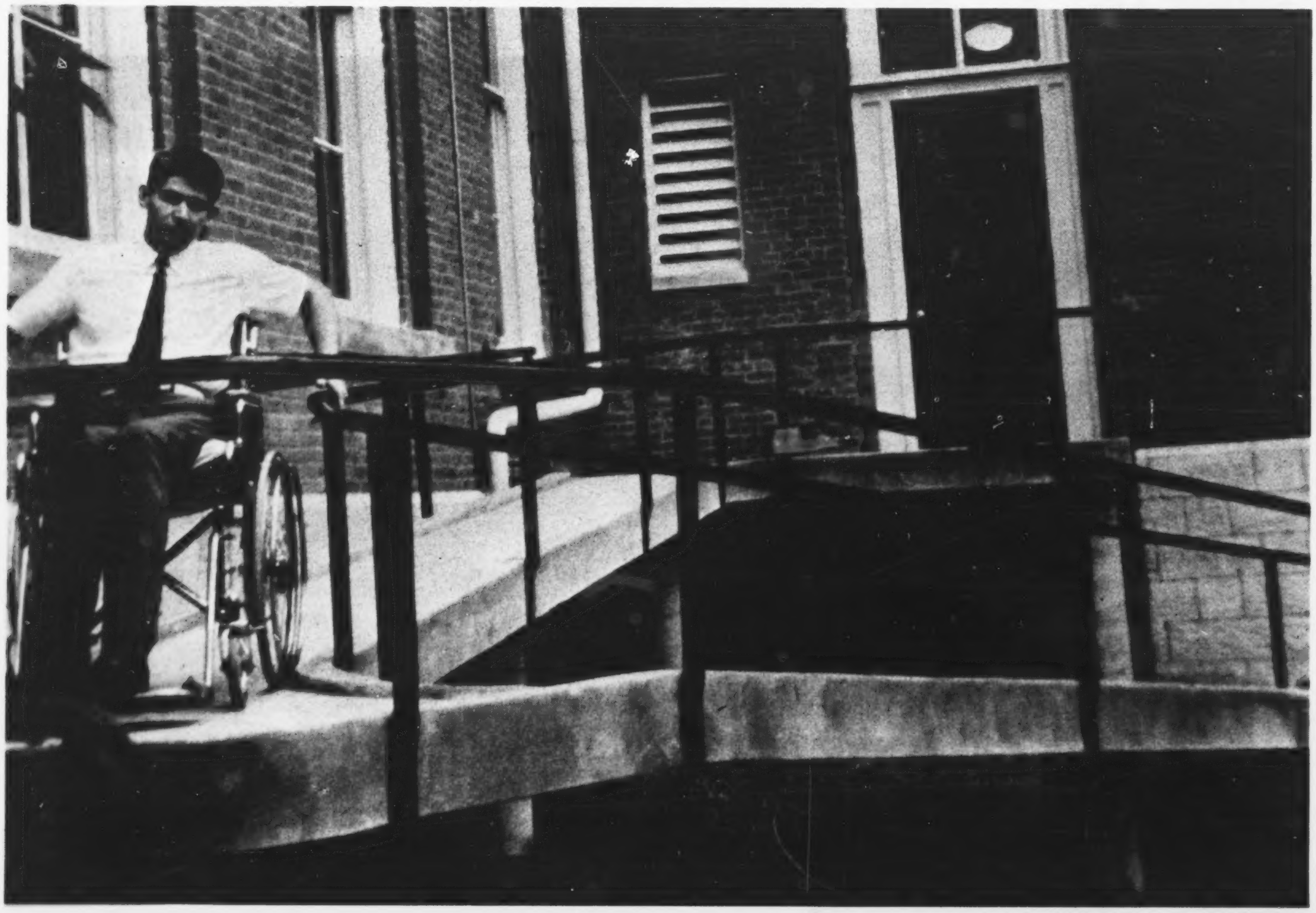
This is an example of a relatively modern building, the entrance to which has been made accessible through construction of a one-step ramp that leads to the wide parapet in front of the doors. Since the doors required no modification, this was an inexpensive and functional means of providing accessibility. Specifications: Ramp set on existing concrete, no curbs, no handrails. Total sq. ft. (3' x 6') = 18. About $2.25 per sq. ft., Total = $40.50.



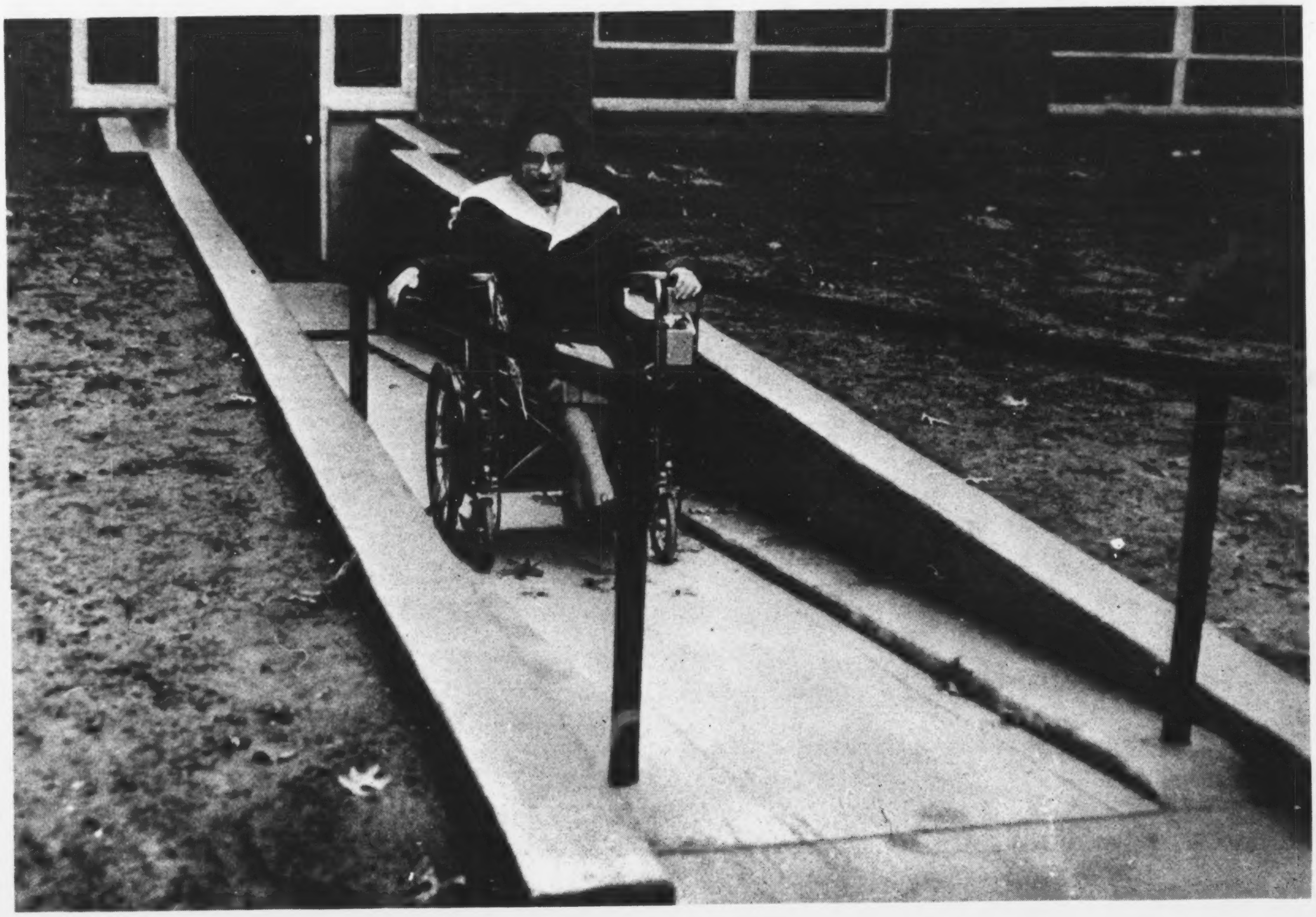
This photograph illustrates the same basic type of one-step ramp as was shown in the previous illustration. The present ramp involved modifying the existing sidewalk up to the level of the door entrance. In accord with American Standard specifications, a level landing at the top of the ramp enables the wheelchair user to open the door without rolling back. Specifications: Modify existing walk to level of door entrance, 7' x 14' + 9' x 5'. No curbs or handrails. Total sq. ft. 145.5. About $1.05 per sq. ft., Total = $150.00.



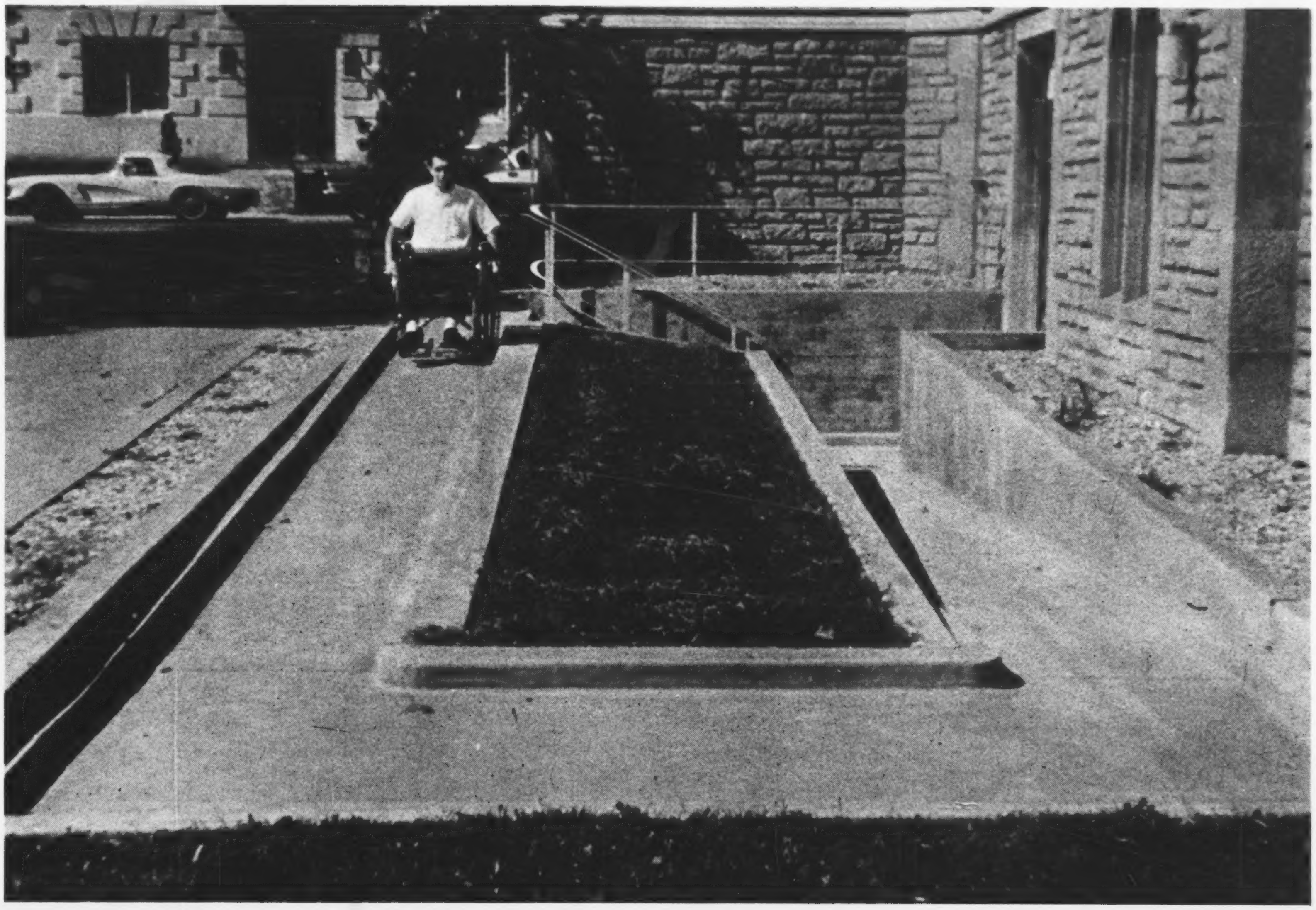
More extensive ramping is required when buildings have neither a basement nor a ground level floor. Shown below is one solution; a hairpin ramp leading from the ground upward to the first floor. Since no previous entrance existed here, the most practical means of providing a door was to convert an existing corridor window into a door. Specifications: Outside ramp on concrete piers 12" in circumference 30" into ground on 18" x 18" footings. "Z" type standard ramp with 2 landings and handrails and steam heat. About 7' rise, area 84' x 3.75' + landings (120 sq. ft.) = 435 sq. ft. About $11.45 per sq. ft., Total = $4,980.00.



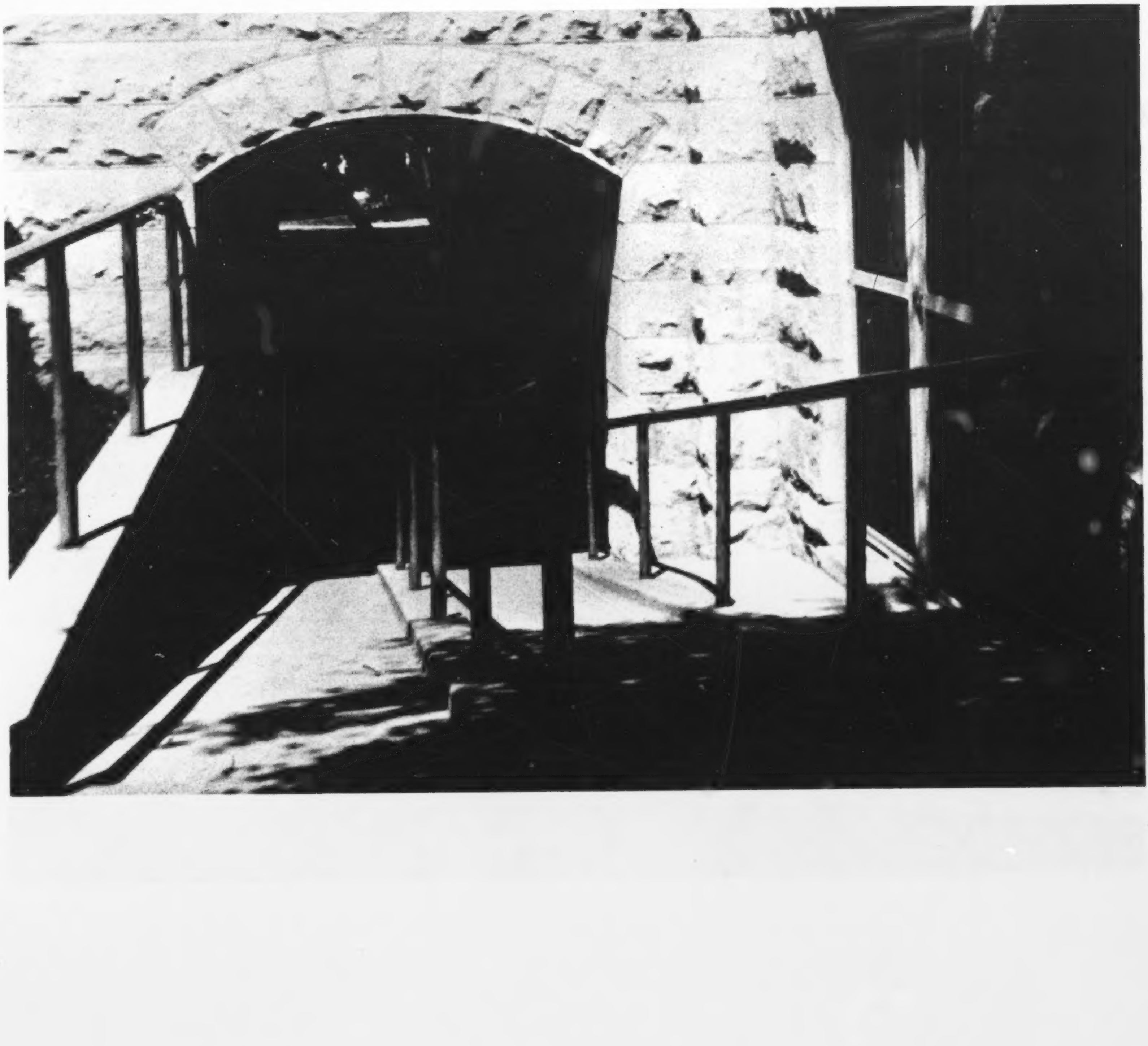
Although the Engineering Complex has no floor at outside ground level, it has a basement floor which could be reached more easily than the upper floor. The most economical accessibility was provided by the external ramp shown below. This ramp leads downward to the basement floor corridor directly across from the elevator. A comparison of the converted doorway with the existing windows can be seen in the photo below: Specifications: Outside ramp cut down from ground level through soil to basement level, steam heated. Retaining walls both sides 6" thick to frost line 30" below ground, with 12" x 12" footings. About 4' drop in elevation, area of 48' x 3.75' = 180 sq. ft. About $3.50 per sq. ft., Total = $630.00.



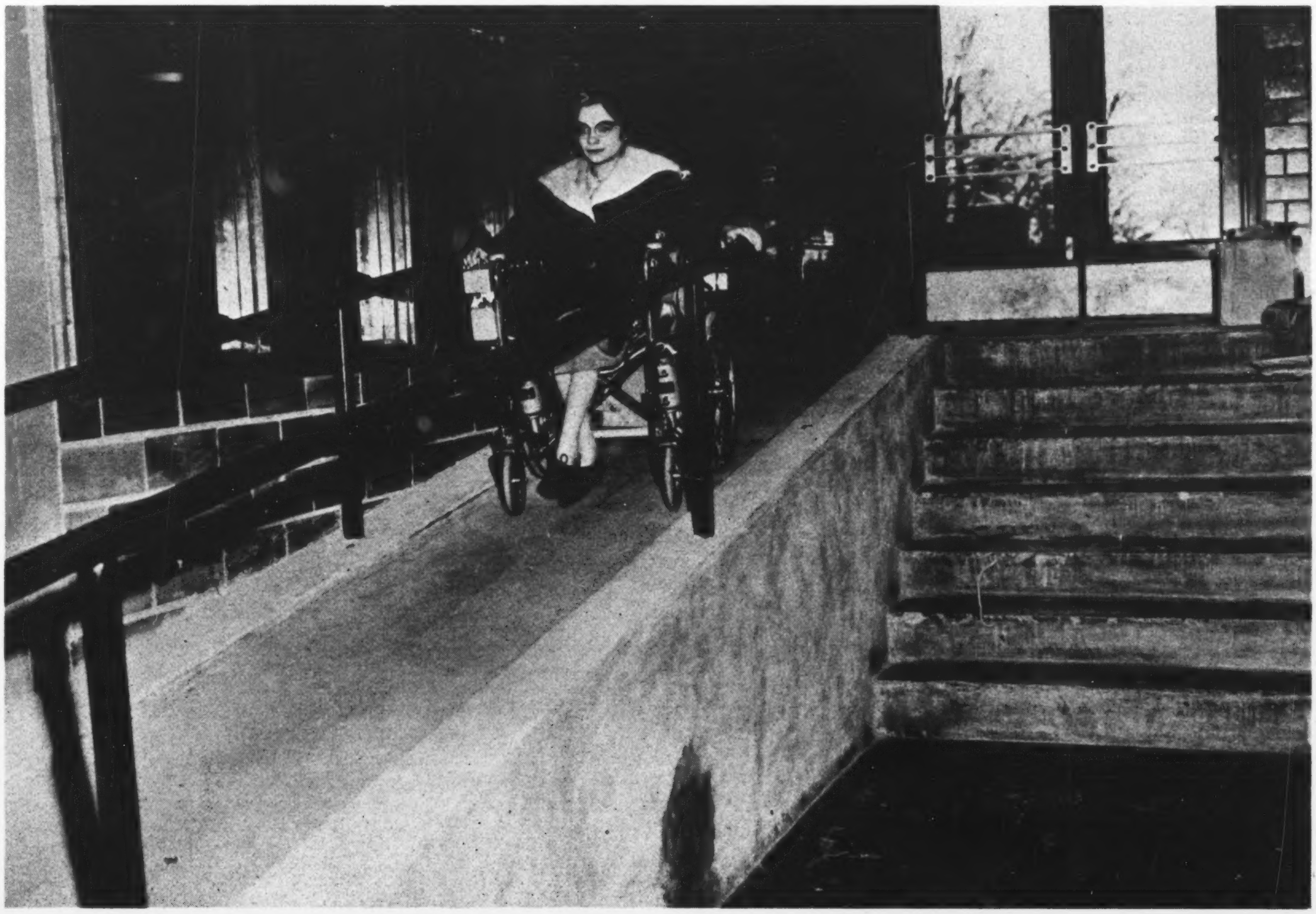
Access to the basement of the Student Union was gained through use of a hairpin ramp placed in the ground. This attractive structure was planned as part of the south wing addition to the Memorial Union. Specifications: Same as preceeding photograph.



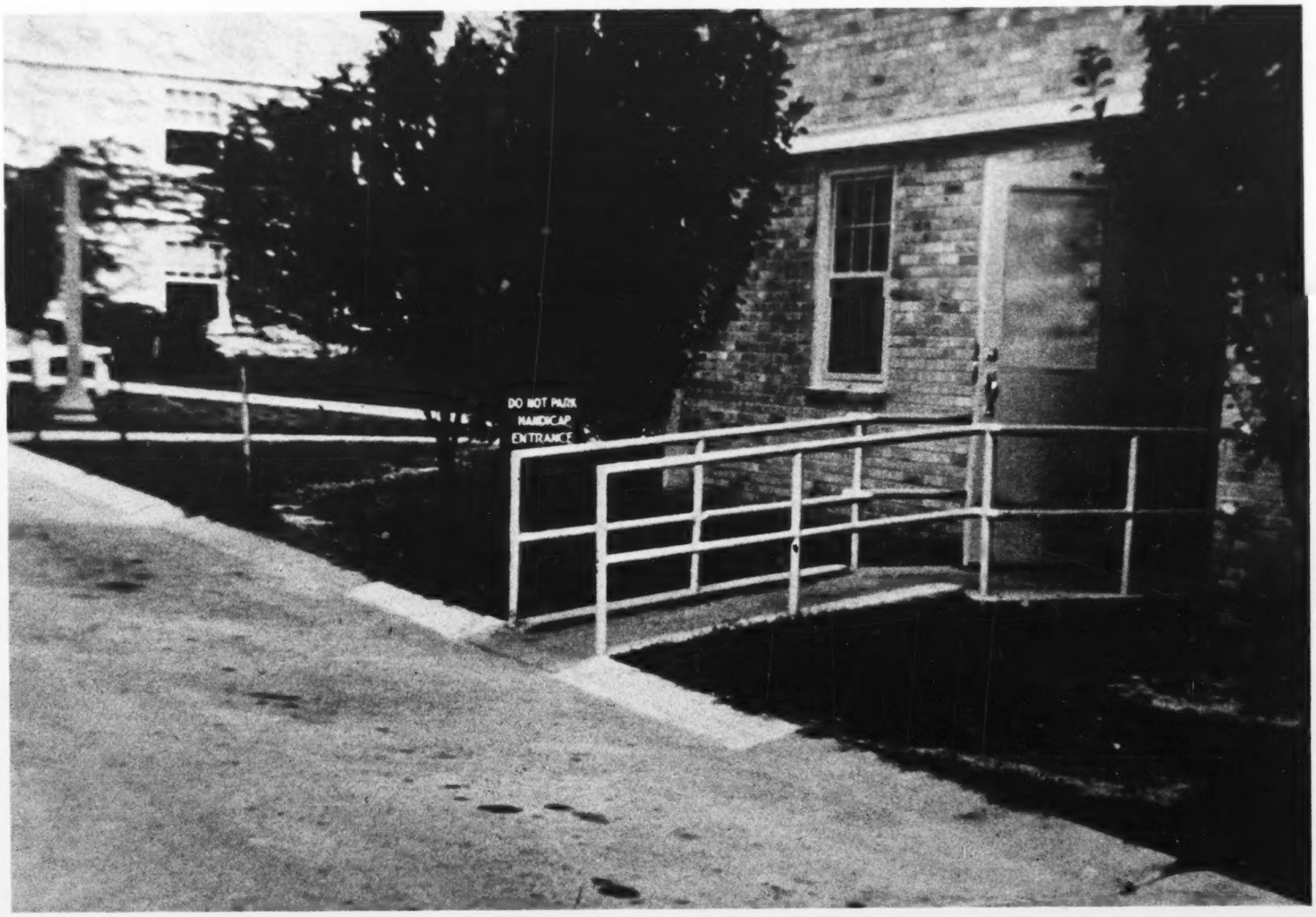
The main administrative building at the University of Missouri, Jesse Hall, also presented a situation wherein no ground level floor existed. The ramp below leads downward, beneath one of the main entrances, over a previously existing set of stairs, to the basement floor. Specifications: Double steam heated ramp on retaining walls, 30" deep, backfilled with rock on 12" x 18" footings. Retaining wall 19' x 4' x 8". Area = 6½' x 27' = 175 sq. ft. About $14.28 per sq. ft., Total = $2,500.00.



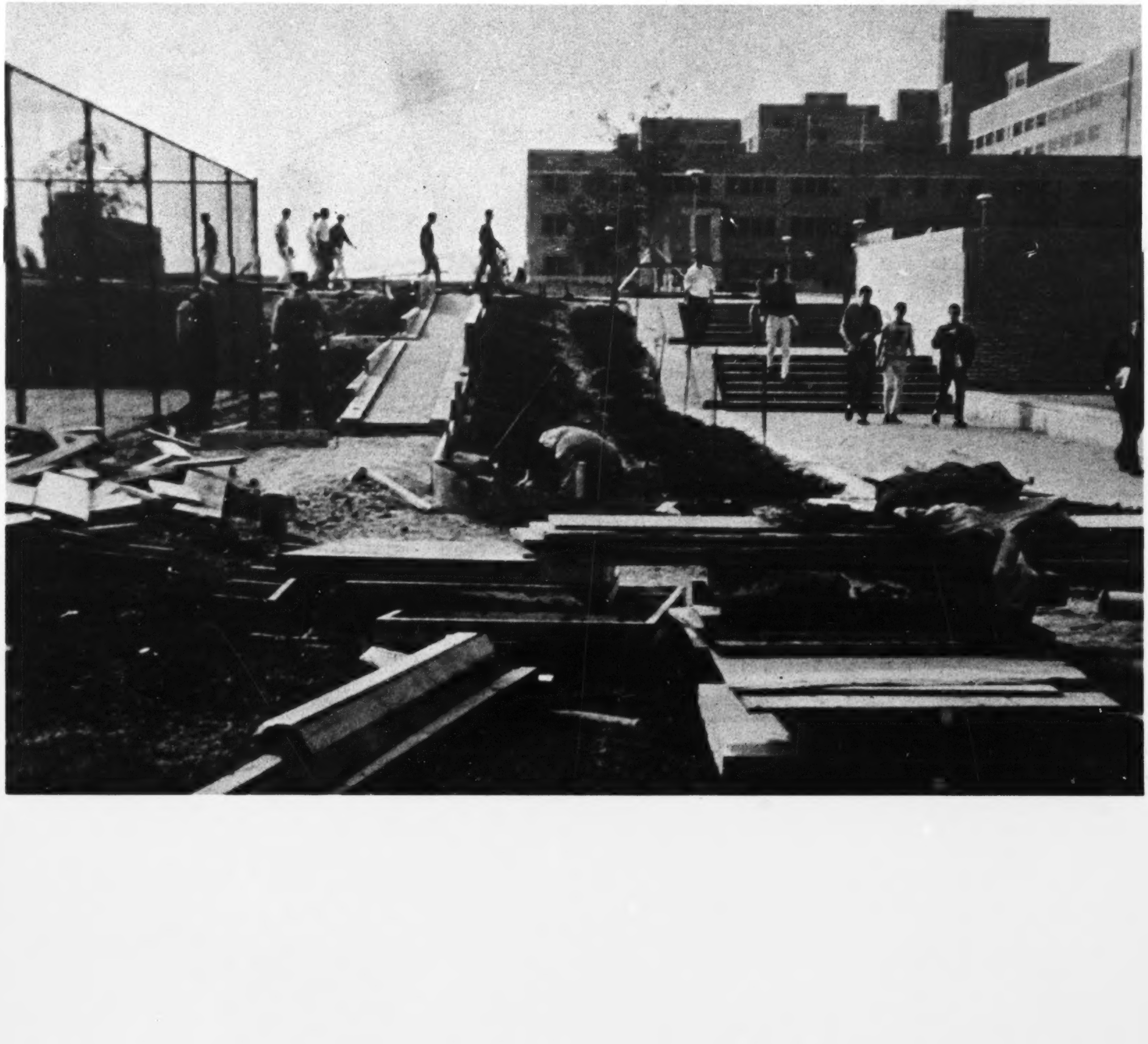
This photograph, taken in the Engineering Complex, illustrates accessibility gained via internal ramping. Since no ground level floor existed, this internal ramp was constructed at the side of the existing stairway and leads downward to the basement floor. Such a ramp is easy to maintain as it is not subject to the outdoor weather. Specifications: Ramp inside building set on existing concrete steps, to one side to allow foot traffic on remainder of steps. Standard ramp with handrails. About 4½' rise, area - 30' x 3.75' = 112 sq. ft. About $2.70 per sq. ft., Total = $304.00.



Since the normal entrances to this dormitory were not appropriate for ramping, this simple ramp and entrance were constructed by making a new entrance at the point of the lower middle window. Specifications: Standard ramp with handrails on retaining walls 30" in ground with 12" x 18" footings. Landing area 5' x 5', ramp area 7' x 3.75', total = 51.25 sq. ft. About $4.87 per sq. ft., Total = $250.00.



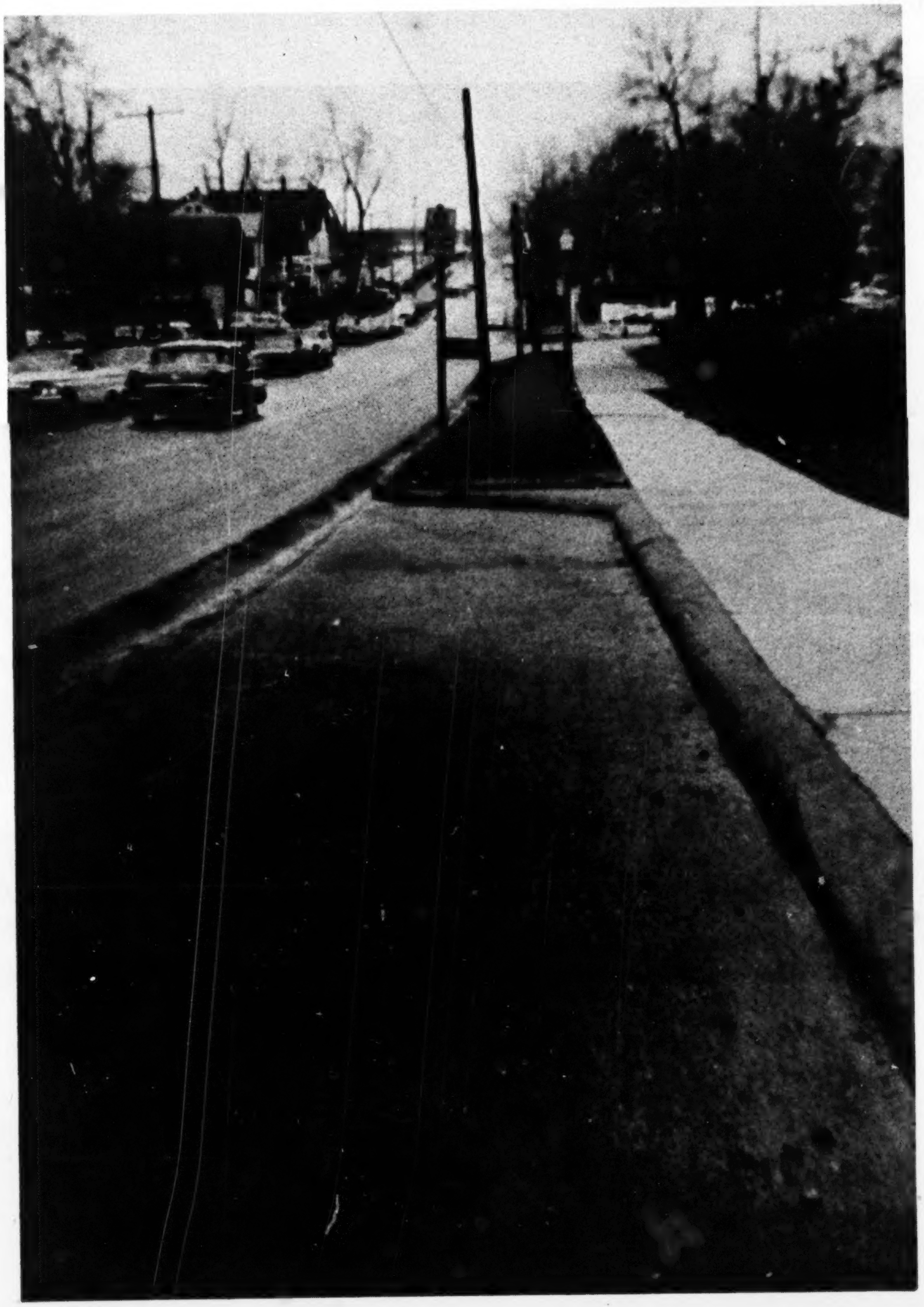
The need for the ramp being constructed below is exemplified by able-bodied students on the right as they descend stairs leading from one level of the campus to another. A rest, required at each 30' interval by American Standards, along with handrails, was incorporated into this long ramp. Specifications: Outside ramp with handrails on retaining walls with 12" x 18" footings to frostline, 30" deep, backfilled with rock. Two landings about 6' x 10'. 12' rise with area = 144' x 3.75' + landings (120 sq. ft.), total = 660 sq. ft. About $4.95 per sq. ft., Total = $3,267.00.



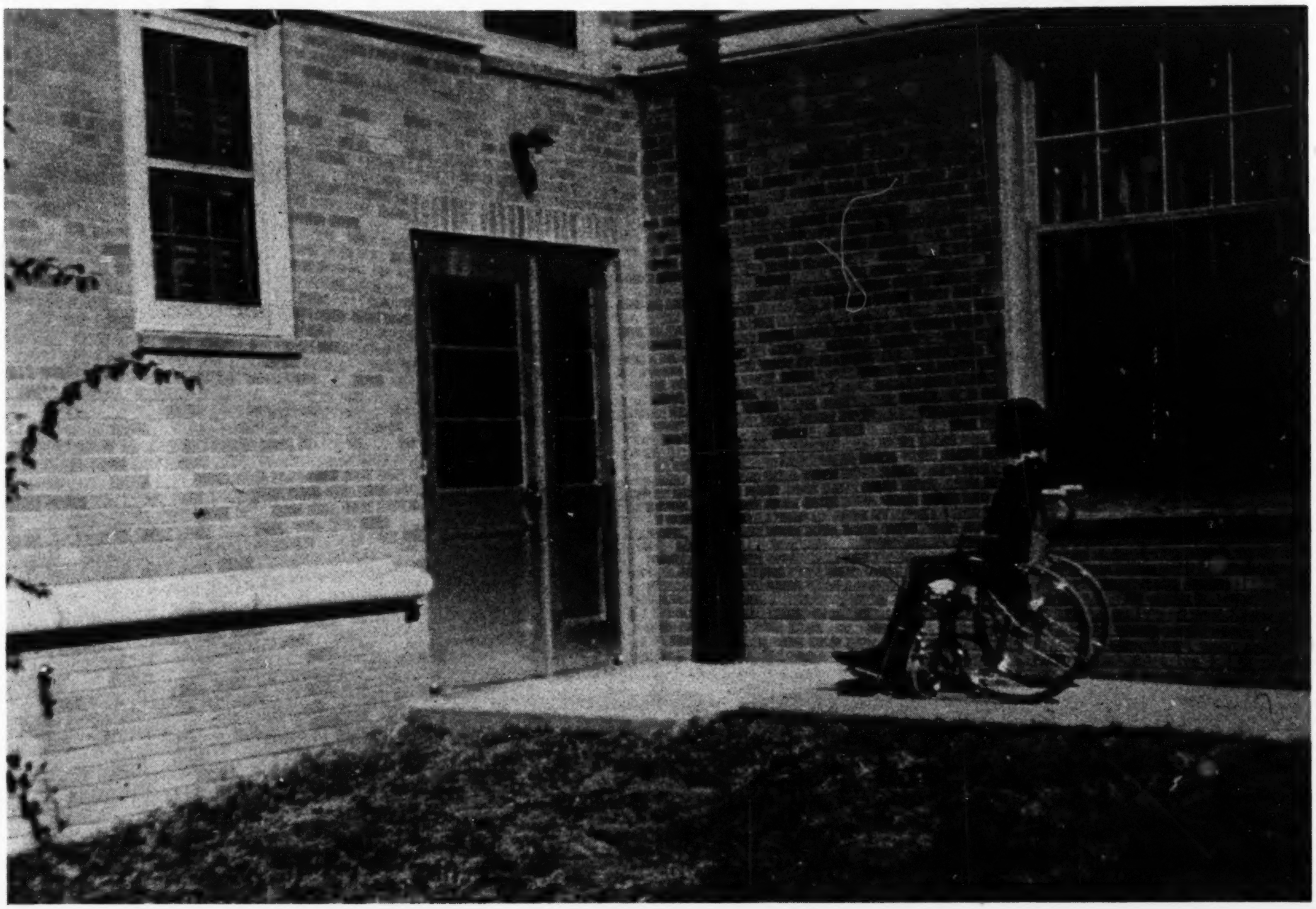
The cut down curb below is essential if the student in a wheelchair is to move from the sidewalk to street level and across. The yellow chevrons help the able-bodied to see the curb to prevent accidental stumbling. Specifications: Curb cut at street level and sidewalk to achieve ramp of 1" to 1' rise each way from street to walk and walk each side. Rolled curb each side, area = 120 sq. ft. About $1.20 per sq. ft., Total = $144.00.

Traversing the Missouri campus requires stairs for the able-bodied at many points. Ramps at critical points enable the handicapped student to overcome these barriers. Specifications: (Ramp at extreme right) Single standard ramp with handrails set next to steps on retaining walls. 30" in ground with 12" x 18" footings. Area = 45' x 3.75', total = 174 sq. ft. About $4.00 per sq. ft., total = $696.00.

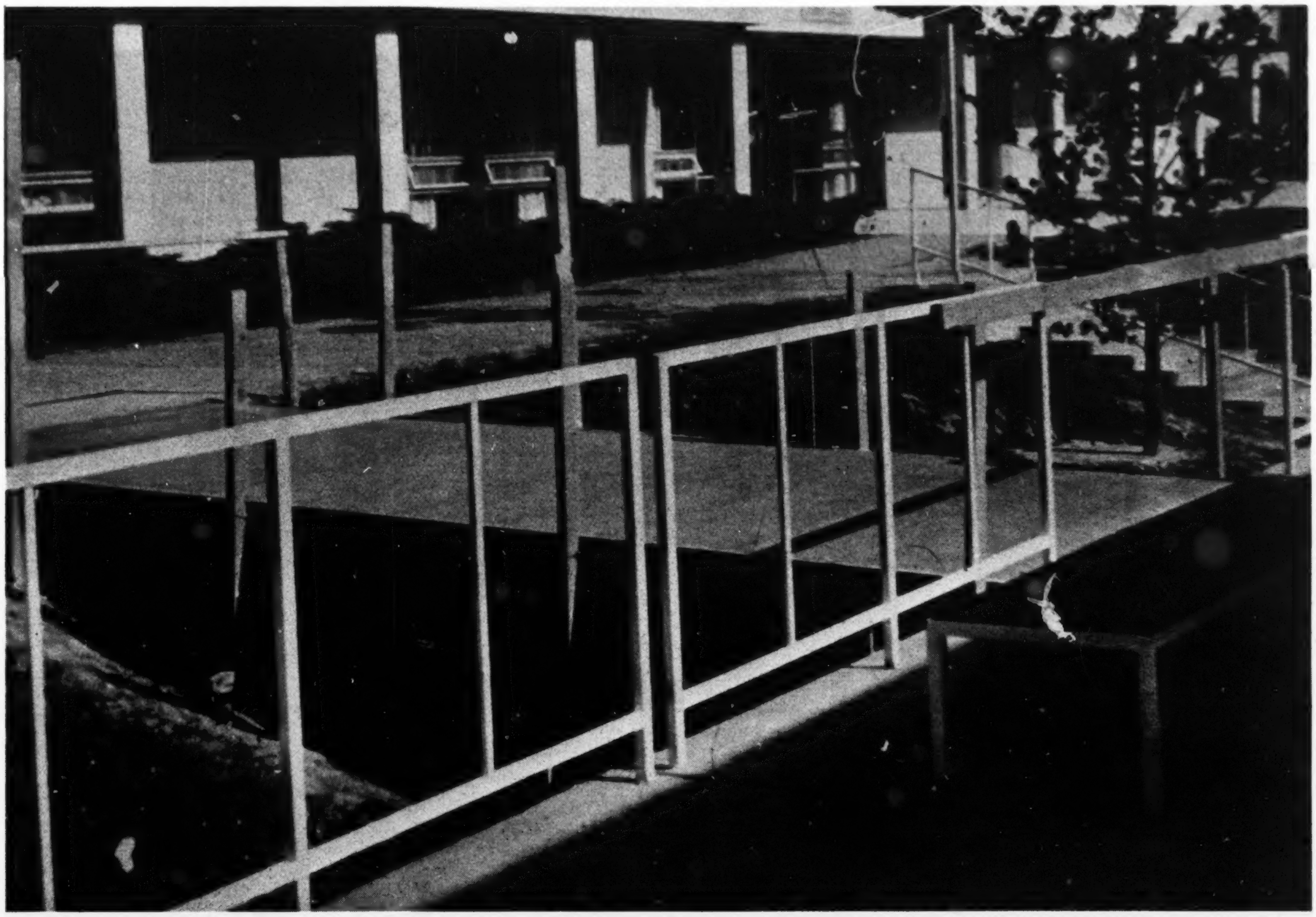
Cutouts recessed from the street enable the modified bus to avoid encumbering the flow of traffic at its loading points. Specifications: Break out existing walk and curb and recess. Replace with 60' rolled curb. Area of 56' x 8' with 8" concrete poured on 10" baserock. Area = 448 sq. ft. About $2.00 per sq. ft., Total = $896.00.



The photo below illustrates the door modification required if existing double leaf doors have a clear opening of less than 32" when open. The old doors are replaced with a pair of uneven size; one leaf is narrow while the other provides a minimum 32" opening. Both leaves can be opened in the same manner as when they were of similar size. Doors and door closers should be constructed and installed according to American Standard specifications. Approximate cost of construction of new doors is $300 to $400.



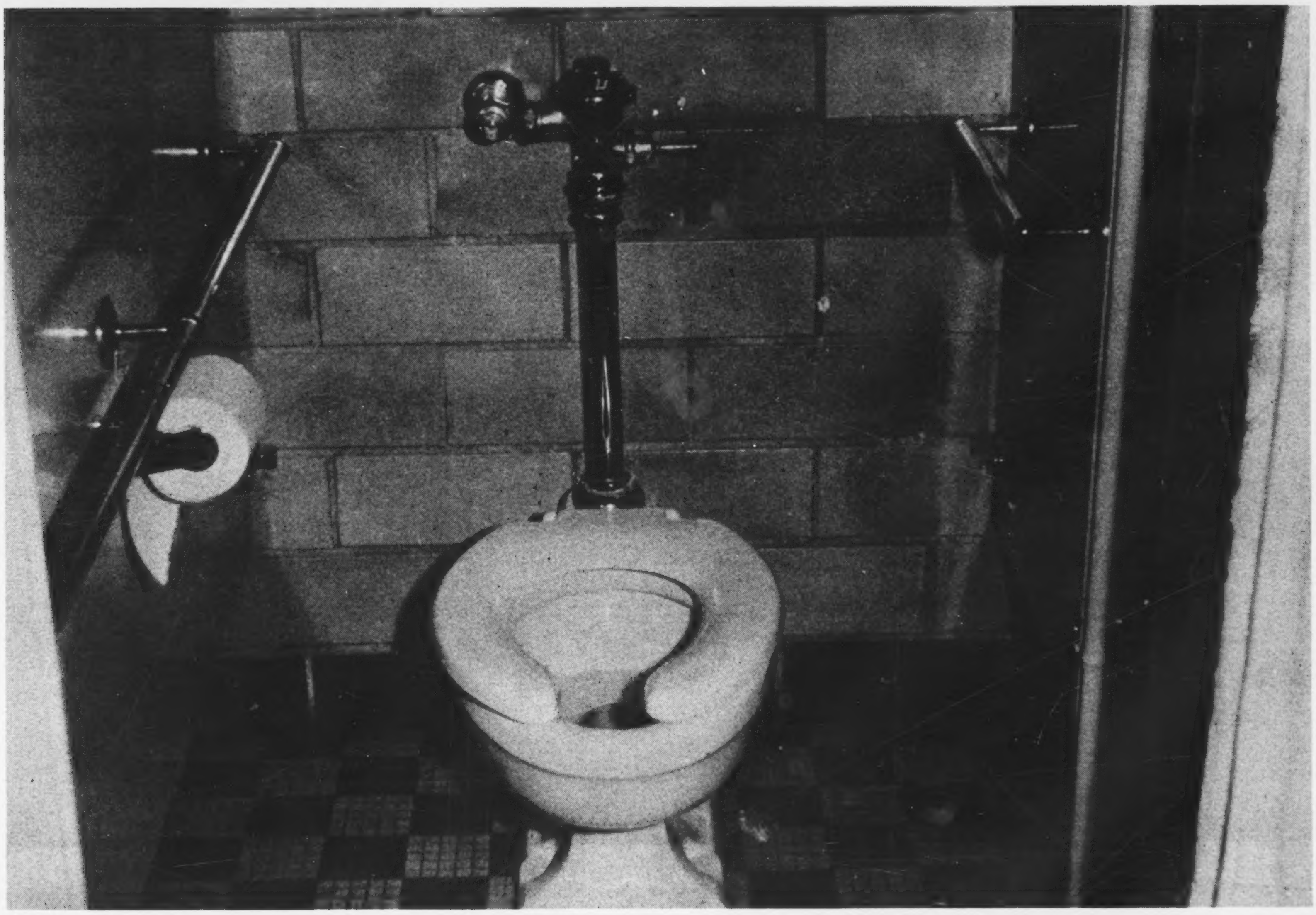
A ravine separating Laws women's dormitory from Dobbs cafeteria is shown below. Steps were a barrier for the handicapped student, necessitating the construction of the bridge shown in the center of the picture. Specifications: Bridge type ramp, approximately 6" rise connected to concrete porch deck in one end and concrete walk on other. Double wheelchair width, spanning 10' wide ravine, set on 18" piers with 24" x 24" footings 30" in ground. Handrails set on edge of bridge decks. Area = 10' x 20', total = 200 sq. ft. About $9.65 per sq. ft., Total = $1,930.00.



This is a typical elevator, enabling the handicapped student to reach all floors once he gets inside a building. Exterior and interior controls within reach of the student and signs, such as the one below, are essential if handicapped students are to make use of these elevators.

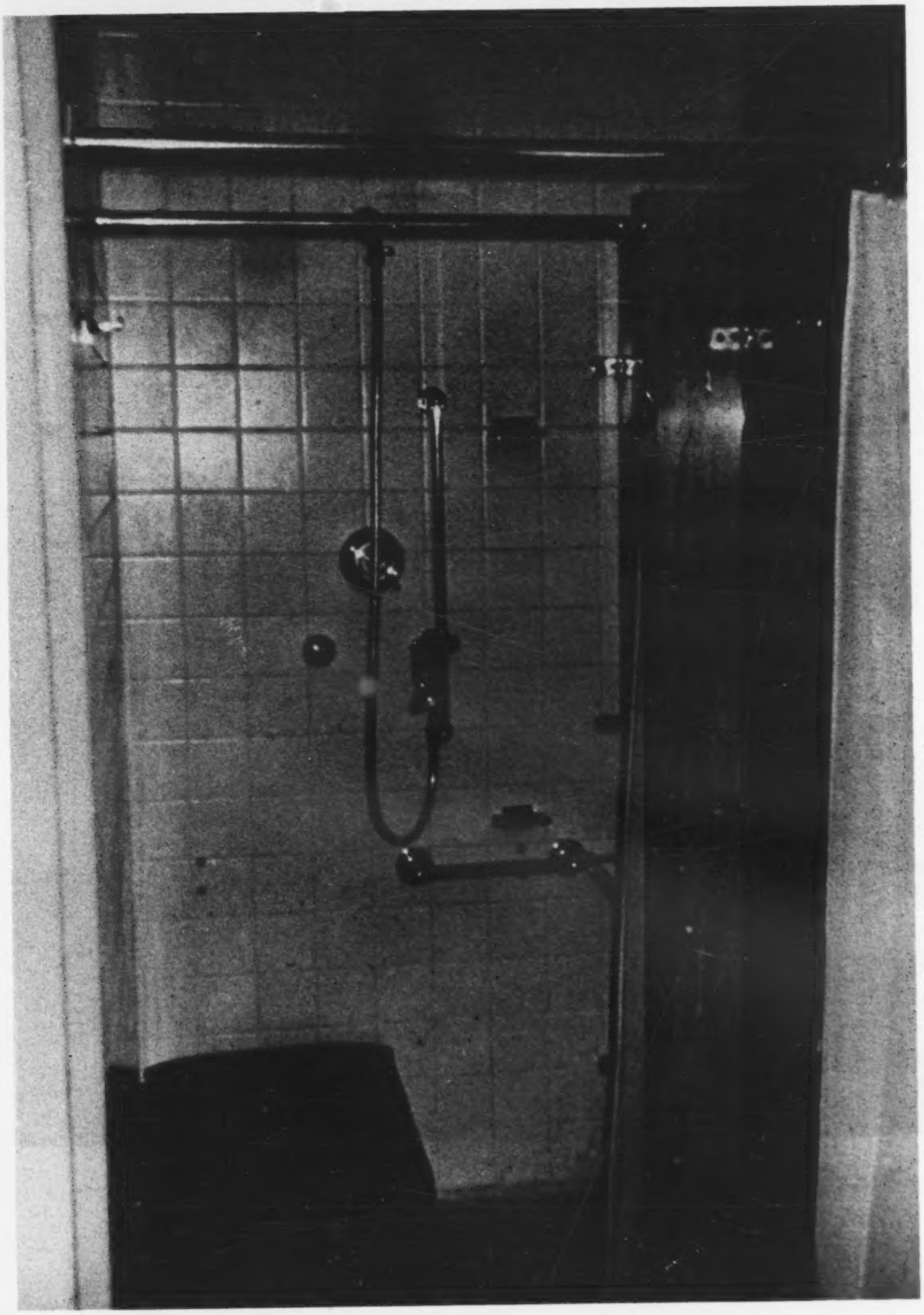
PPED
Y IN THE
VATOR

Below is a modified toilet stall, equipped with handrails, a half-size partition (on right), and curtains. The short partition permits more maneuverability for the individual who must make a side transfer. Vinyl curtain is durable and costs about $1.00 per yd. Specifications: Grab bars installed to American Standard specifications cost about $2.00 to $3.25 per linear foot depending upon the labor involved. A 2' bar would be placed on each side, centered over front edge of toilet stool.

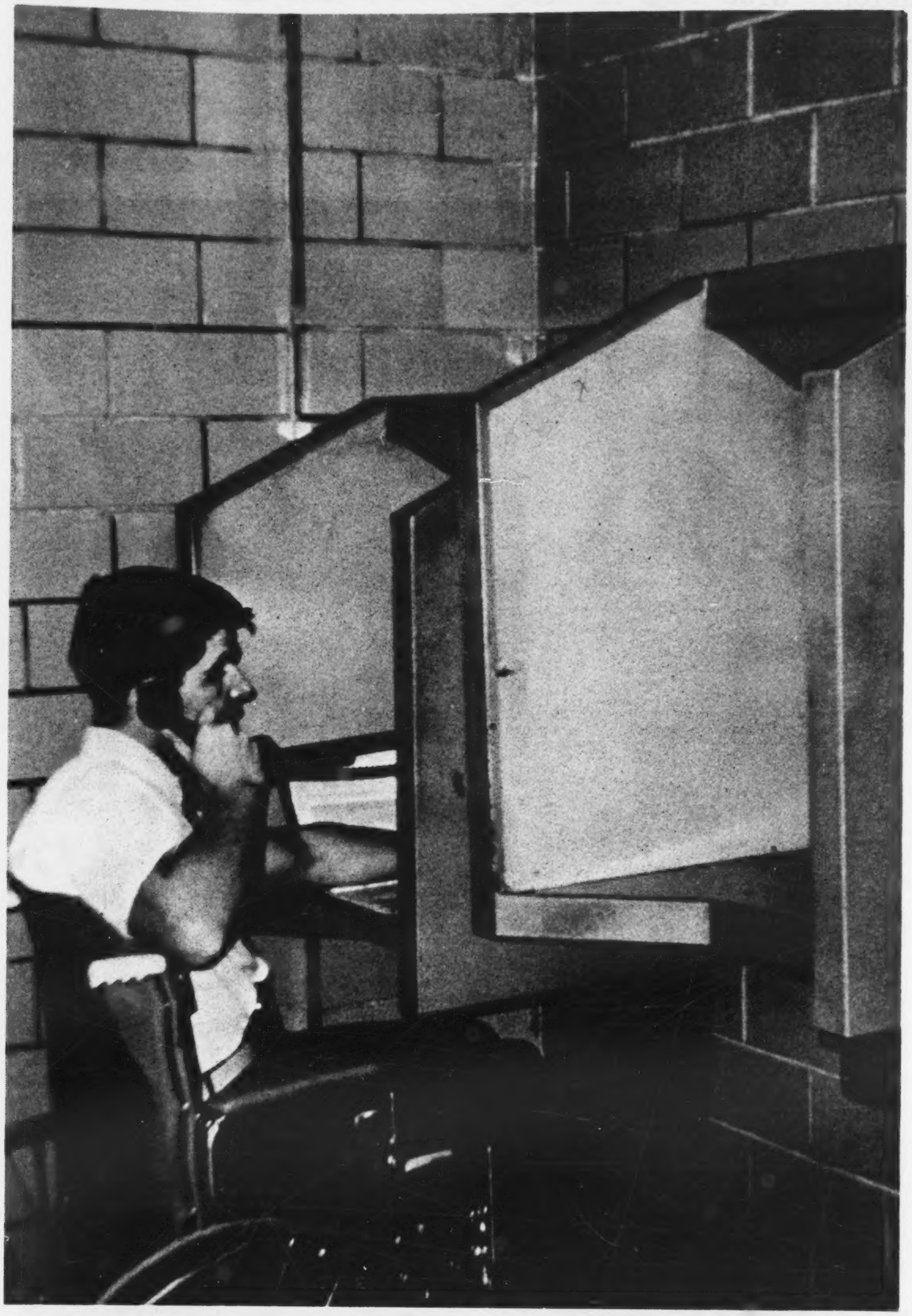


Showers must be equipped with flexible shower heads, grab bars, and the special seat as illustrated. Specifications: Flexible shower head about $40.00 plus installation. Grab bars on side opposite seat and half of back wall. Shower seat is a fold down type[1] about $114.00.

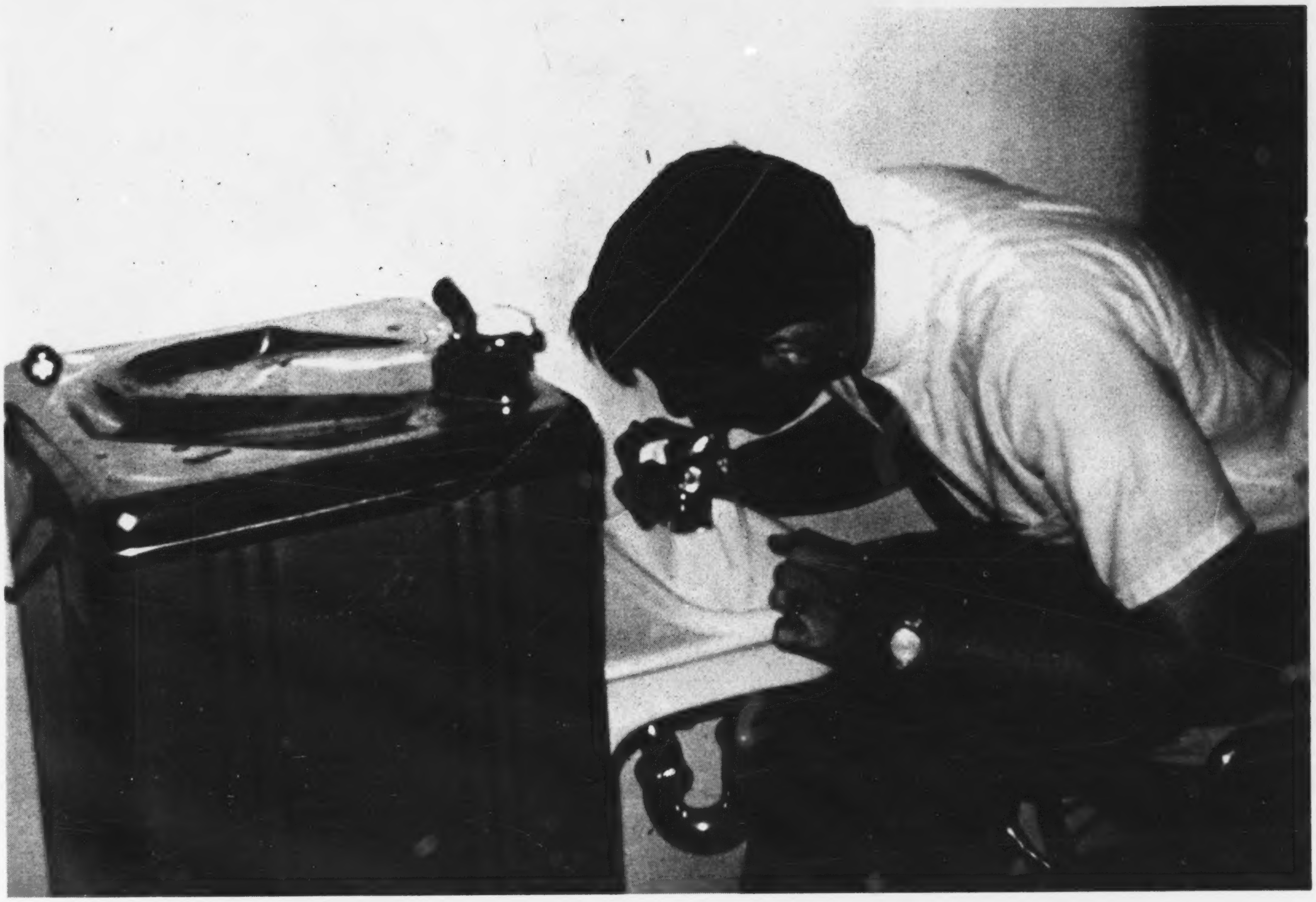
[1] G. M. Ketchan Co.; Glendale 27, New York.



The student can use the public telephone once it has been lowered to the recommended height of 48" from center of dial to floor.

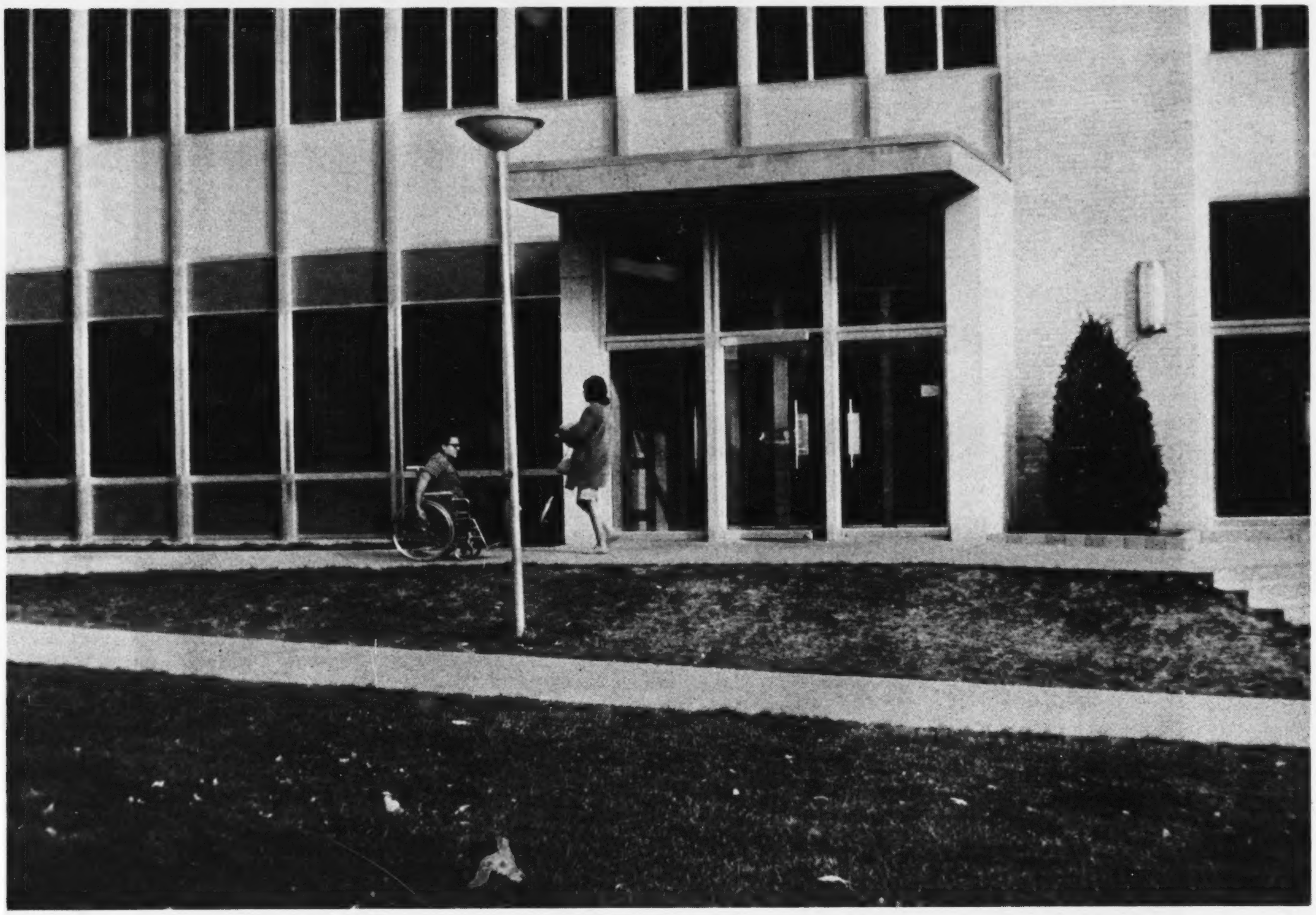


This special fountain is located at 30" above the floor where the wheelchair student can reach it. Approximate cost is $45 plus $30 installation. (Although this fountain was not originally intended for them, children find this installation very useful.)

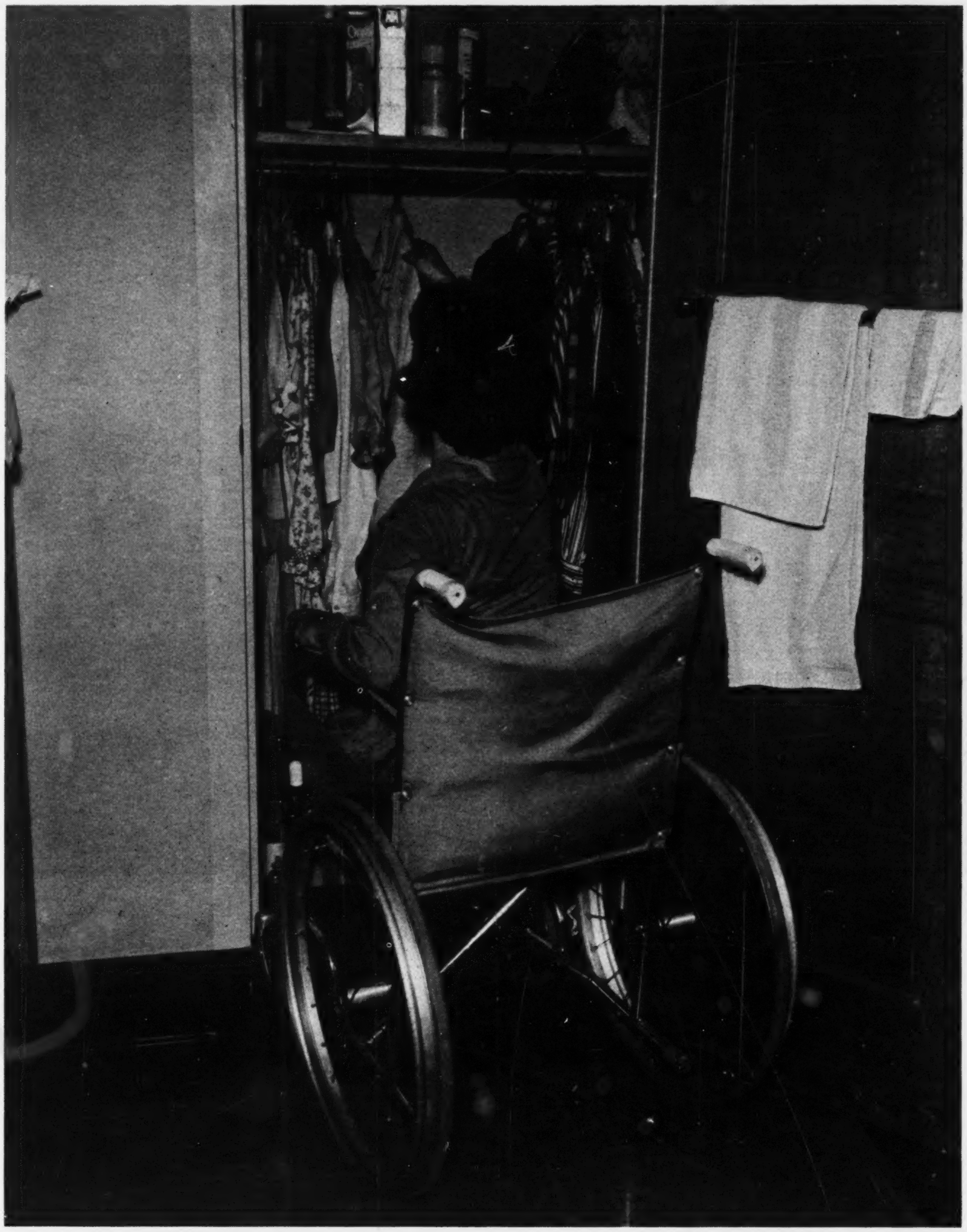


Busy entrances are sometimes equipped with electric doors so that both the handicapped and able-bodied can enter with ease. Our requirement which is above the common "supermarket type" doors is that a door will not activate if someone is on the other side in its opening path. Approximate cost is $11,000 to $15,000.

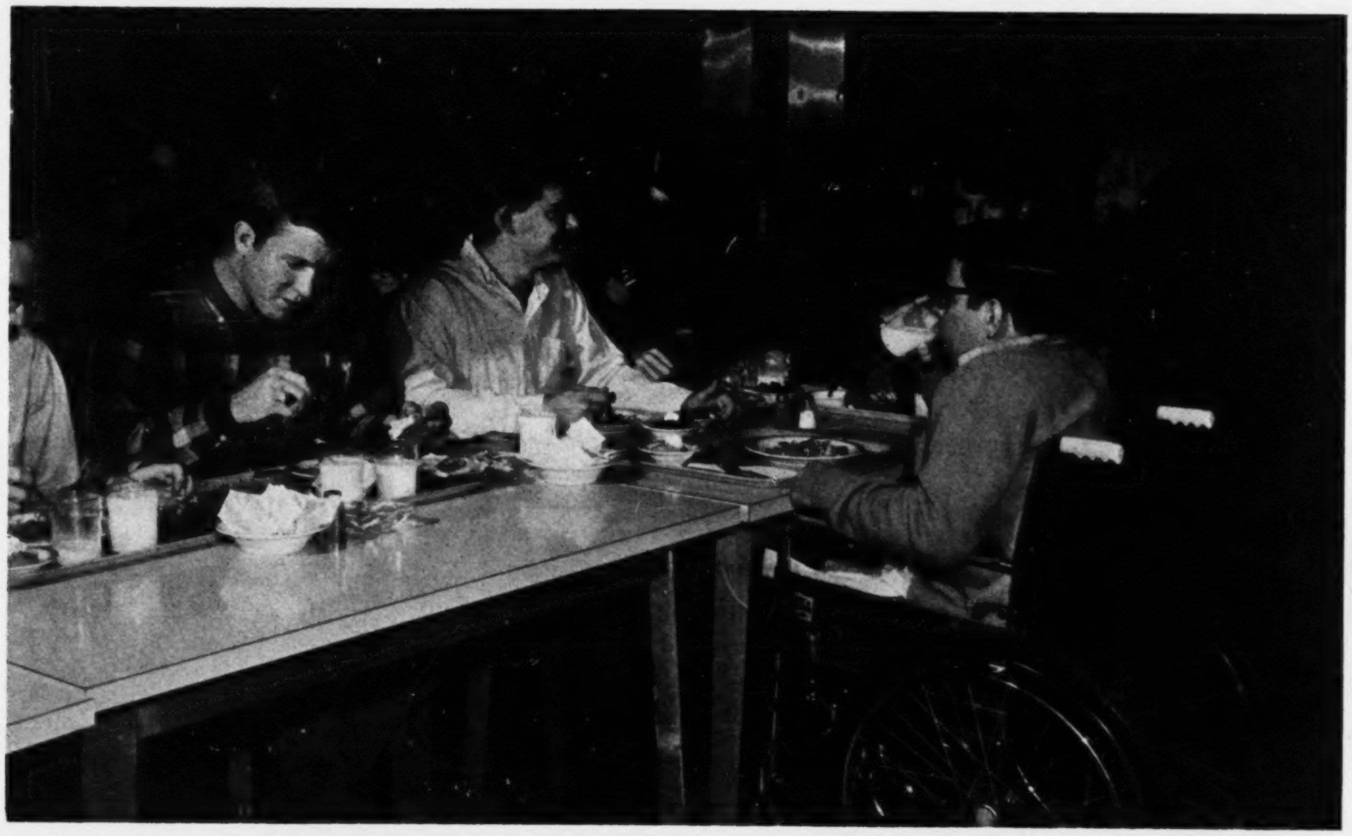
The University Board of Curators now requires all newly constructed University buildings to have accessibility incorporated into their construction. The graduated sidewalk on the left makes for easy wheelchair entrance and appears as a natural part of the landscape.



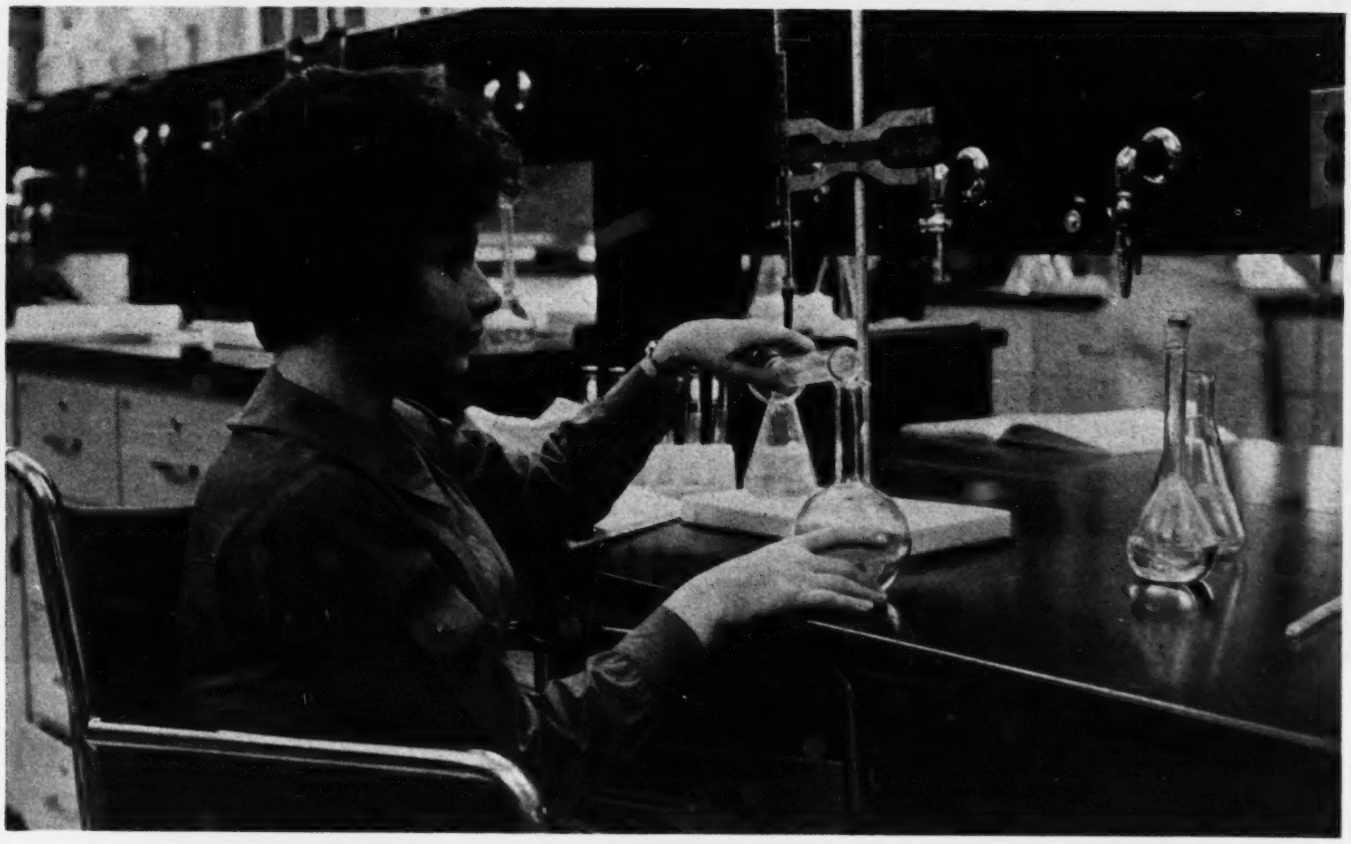
A lowered closet bar and shelf enables the student to more easily continue independent living in the dormitory. At 50 inches from the floor, clothes do not reach the floor but reaching from a wheelchair is possible.



An accessible dormitory cafeteria allows the handicapped student to eat along with able-bodied friends.



A completely equipped laboratory counter is lowered to allow wheelchair arms to clear underneath while permitting the student to participate in a regular chemistry class.



The older design hydraulic lift on the first bus purchased requires the driver to leave his seat to operate it.

ITY OF MISSOURI
COLUMBI

Installing an advanced design lift in the front door opening and placing the passenger door to the rear (as illustrated by the new bus below) allows the driver to remain in his seat while he controls the lift. Additional advantages are passenger independence on the lift and ease of maneuverability of the bus into loading position on the curb.

AMERICAN STANDARD SPECIFICATIONS
FOR MAKING
BUILDINGS AND FACILITIES
ACCESSIBLE TO, AND USABLE BY,
THE PHYSICALLY HANDICAPPED

Sponsors

National Society for Crippled Children and Adults
The President's Committee on Employment of the
Physically Handicapped

Approved October 31, 1961
AMERICAN STANDARDS ASSOCIATION
INCORPORATED

CONTENTS

SECTION PAGE

1. Scope and Purpose 88
   1.1 Scope 88
   1.2 Purpose 88

2. Definitions 88
   2.1 Non-ambulatory Disabilities 88
   2.2 Semi-ambulatory Disabilities 88
   2.3 Sight Disabilities 88
   2.4 Hearing Disabilities 88
   2.5 Disabilities of Incoordination 88
   2.6 Aging 89
   2.7 Standard 89
   2.8 Fixed Turning Radius, Wheel to Wheel 89
   2.9 Fixed Turning Radius, Front Structure to Rear Structure 89
   2.10 Involved (Involvement) 89
   2.11 Ramps, Ramps with Gradients 89
   2.12 Walk, Walks 89
   2.13 Appropriate Number 89

3. General Principles and Considerations 90
   3.1 Wheelchair Specifications 90
   3.2 The Functioning of a Wheelchair 90
   3.3 The Adult Individual Functioning in a Wheelchair 90
   3.4 The Individual Functioning on Crutches 91

4. Site Development 91
   4.1 Grading 91
   4.2 Walks 91
   4.3 Parking Lots 92

5. Buildings 93
   5.1 Ramps with Gradients 93
   5.2 Entrances 93
   5.3 Doors and Doorways 94
   5.4 Stairs 94
   5.5 Floors 95
   5.6 Toilet Rooms 95
   5.7 Water Fountains 96
   5.8 Public Telephones 96
   5.9 Elevators 96
   5.10 Controls 97
   5.11 Identification 97
   5.12 Warning Signals 97
   5.13 Hazards 97

American Standard Specifications for Making Buildings and Facilities Accessible to, and Usable by, the Physically Handicapped

1. Scope and Purpose

1.1 Scope

1.1.1 This standard applies to all buildings and facilities used by the public. It applies to temporary or emergency conditions as well as permanent conditions. It does not apply to private residences.

1.1.2 This standard is concerned with non-ambulatory disabilities, hearing disabilities, disabilities of incoordination, and aging.[1]

1.2 Purpose. This standard is intended to make all buildings and facilities used by the public accessible to, and functional for, the physically handicapped, to, through, and within their doors, without loss of function, space, or facility where the general public is concerned. It supplements existing American Standards, and reflects great concern for safety of life and limb. In cases of practical difficulty, unnecessary hardship, or extreme differences, administrative authorities may grant exceptions from the literal requirements of this standard or permit the use of other methods or materials, but only when it is clearly evident that equivalent facilitation and protection are thereby secured.

2. Definitions

2.1 Non-ambulatory Disabilities. Impairments that, regardless of cause or manifestation, for all practical purposes, confine individuals to wheelchairs.

2.2 Semi-ambulatory Disabilities. Impairments that cause individuals to walk with difficulty or insecurity. Individuals using braces or crutches, amputees, arthritics, spastics, and those with pulmonary and cardiac ills may be semi-ambulatory.

2.3 Sight Disabilities. Total blindness or impairments affecting sight to the extent that the individual functioning in public areas is insecure or exposed to danger.

2.4 Hearing Disabilities. Deafness of hearing handicaps that might make an individual insecure in public areas because he is unable to communicate or hear warning signals.

2.5 Disabilities of Incoordination. Faulty coordination or palsy from brain, spinal, or peripheral nerve injury.

---

[1] See definitions in Section 2.

2.6 Aging. Those manifestations of the aging processes that significantly reduce mobility, flexibility, coordination, and perceptiveness but are not accounted for in the aforementioned categories.

2.7 Standard. When this term appears in small letters and is not preceded by the word "American," it is descriptive and does not refer to an American Standard approved by ASA; for example, a "standard" wheelchair is one characterized as standard by the manufacturers.

2.8 Fixed Turning Radius, Wheel to Wheel. The tracking of the caster wheels and large wheels of a wheelchair when pivoting on a spot.

2.9 Fixed Turning Radius, Front Structure to Rear Structure. The turning radius of a wheelchair, left front-foot platform to right rear wheel, or right front-foot platform to left rear wheel, when pivoting on a spot.

2.10 Involved (Involvement). A portion or portions of the human anatomy or physiology, or both, that have a loss or impairment of normal function as a result of genesis, trauma, disease, inflammation, or degeneration.

2.11 Ramps, Ramps with Gradients. Because the term "ramp" has a multitude of meanings and uses, its use in this text is clearly defined as ramps with gradients (or ramps with slopes) that deviate from what would otherwise be considered the normal level. An exterior ramp, as distinguished from a "walk," would be considered an appendage to a building leading to a level above or below existing ground level. As such, a ramp shall meet certain requirements similar to those imposed upon stairs.

2.12 Walk, Walks. Because the terms "walk" and "walks" have a multitude of meanings and uses, their use in this text is clearly defined as a predetermined, prepared-surface, exterior pathway leading to or from a building or facility, or from one exterior area to another, placed on the existing ground level and not deviating from the level of the existing ground immediately adjacent.

2.13 Appropriate Number. As used in this text, appropriate number means the number of a specific item that would be necessary, in accord with the purpose and function of a building or facility, to accommodate individuals with specific disabilities in proportion to the anticipated number of individuals with disabilities who would use a particular building or facility.

EXAMPLE: Although these specifications shall apply to all buildings and facilities used by the public, the numerical need for a specific item would differ, for example, between a major transportation terminal, where many individuals with diverse disabilities would be continually coming and going, an office building, or factory, where varying numbers of individuals with disabilities of varying manifestations (in many instances, very large numbers) might be employed or have reason for frequent visits, a school or church, where the number of individiduals may be fixed and activities more definitive, and the many other buildings and facilities dedicated to specific functions and purposes.

NOTE: Disabilities are specific and where the individual has been properly evaluated and properly oriented and where architectural barriers have been elimenated, a specific disability does not constitute a handicap. It should be emphasized that more and more of those physically disabled are becoming participants, rather than spectators, in the fullest meaning of the word.

3. General Principles and Considerations

3.1 Wheelchair Specifications. The collapsible-model wheelchair of tubular metal construction with plastic upholstery for back and seat is most commonly used. The standard model of all manufacturers falls within the following limits, which were used as the basis of consideration:

(1) Length: 42 inches

(2) Width, when open: 25 inches

(3) Height of seat from floor: 19½ inches

(4) Height of armrest from floor: 29 inches

(5) Height of pusher handles (rear) from floor: 36 inches

(6) Width, when collapsed: 11 inches

3.2 The Functioning of a Wheelchair

3.2.1 The fixed turning radius of a standard wheelchair, wheel to wheel, is 18 inches. The fixed turning radius, front structure to rear structure, is 31.5 inches.

3.2.2 The average turning space required (180 and 360 degrees) is 60 x 60 inches.

NOTE: Actually, a turning space that is longer than it is wide, specifically, 63 x 56 inches, is more workable and desirable. In an area with two open ends, such as might be the case in a corridor, a minimum of 54 inches between two walls would permit a 360-degree turn.

3.2.3 A minimum width of 60 inches is required for two individuals in wheelchairs to pass each other.

3.3 The Adult Individual Functioning in a Wheelchair[2]

3.3.1 The average unilateral vertical reach is 60 inches and ranges from 54 inches to 78 inches.

---

[2] Extremely small, large, strong, or weak and involved individuals could fall outside the ranges in 3.3.1, 3.3.2, 3.3.3, and their reach could differ from the figure given in 3.3.4. However, these reaches were determined using a large n number of individuals who were functionally trained, with a wide range in individual size and involvement.

3.3.2 The average horizontal working (table) reach is 30.8 inches and ranges from 28.5 inches to 33.2 inches.

3.3.3 The bilateral horizontal reach, both arms extended to each side, shoulder high, ranges from 54 inches to 71 inches and averages 64.5 inches.

3.3.4 An individual reaching diagonally, as would be required in using a wall-mounted dial telephone or towel dispenser, would make the average reach (on the wall) 48 inches from the floor.

3.4 The Individual Functioning on Crutches[3]

3.4.1 On the average, individuals 5 feet 6 inches tall require an average of 31 inches between crutch tips in the normally accepted gaits.[4]

3.4.2 On the average, individuals 6 feet 0 inches tall require an average of 32.5 inches between crutch tips in the normally accepted gaits.[4]

4. Site Development[5]

4.1 Grading. The grading of ground, even contrary to existing topography, so that it attains a level with a normal entrance will make a facility accessible to individuals with physical disabilities.

4.2 Walks

4.2.1 Public walks should be at least 48 inches wide and should have a gradient not greater than 5 percent.[6]

4.2.2 Such walks shall be of a continuing common surface, not interrupted by steps or abrupt changes in level.

---

[3] Most individuals ambulating on braces or crutches, or both, or on canes are able to manipulate within the specifications prescribed for wheelchairs, although doors present quite a problem at times. However, attention is called to the fact that a crutch tip extending laterally from an individual is not obvious to others in heavily trafficked areas, certainly not as obvious or protective as a wheelchair and is, therefore, a source of vulnerability.

[4] Some cerebral palsied individuals, and some severe arthritics, would be extreme exceptions to 3.4.1 and 3.4.2.

[5] Site development is the most effective means to resolve the problems created by topography, definitive architectural designs or concepts, water table, existing streets, and atypical problems, signularly or collectively, so that aggress, ingress, and egress to buildings by physically disabled can be facilitated while preserving the desired design and effect of the architecture.

[6] It is essential that the gradient of walks and driveways be less than that prescribed for ramps, since walks would be void of handrails and curbs and would be considerably longer and more vulnerable to the elements. Walks of near maximum grade and considerable length should have level areas at intervals for purposes of rest and safety. Walks or driveways should have a nonslip surface.

4.2.3 Wherever walks cross other walks, driveways, or parking lots they should blend to a common level.[7]

NOTE: 4.1 and 4.2, separately or collectively, are greatly aided by terracing, retaining walls, and winding walks allowing for more gradual incline, thereby making almost any building accessible to individuals with permanent physical disabilities, while contributing to its esthetic qualities.

4.2.4 A walk shall have a level platform at the top which is at least 5 feet by 5 feet, if a door swings out onto the platform or toward the walk. This platform shall extend at least 1 foot beyond each side of the doorway.

4.2.5 A walk shall have a level platform at least 3 feet deep and 5 feet wide, if the door does not swing onto the platform or toward the walk. This platform shall extend at least 1 foot beyond each side of the doorway.

4.3 Parking Lots

4.3.1 Spaces that are accessible and approximate to the facility should be set aside and identified for use by individuals with physical disabilities.

4.3.2 A parking space open on one side, allowing room for individuals in wheelchairs or individuals on braces and crutches to get in and out of an automobile onto a level surface, suitable for wheeling and walking, is adequate.

4.3.3 Parking spaces for individuals with physical disabilities when placed between two conventional diagonal or head-on parking spaces should be 12 feet wide.

4.3.4 Care in planning should be exercised so that individuals in wheelchairs and individuals using braces and crutches are not compelled to wheel or walk behind parked cars.

4.3.5 Consideration should be given the distribution of spaces for use by the disabled in accordance with the frequency and persistency of parking needs.

4.3.6 Walks shall be in conformity with 4.2.

---

[7] This specification does not require the elimination of curbs, which, particularly if they occur at regular intersections, are a distinct safety feature for all of the handicapped, particularly the blind. The preferred method of meeting the specification is to have the walk incline to the level of the street. However, at principal intersections, it is vitally important that the curb run parallel to the street, up to the point where the walk is inclined, at which point the curb would turn in and gradually meet the level of the walk at its highest point. A less preferred method would be to gradually bring the surface of the driveway or street to the level of the walk. The disadvantage of this method is that a blind person would not know when he has left the protection of a walk and entered the hazards of a street or driveway.

5. Buildings

5.1 Ramps with Gradients. Where ramps with gradients are necessary or desired, they shall conform to the following specifications:

5.1.1 A ramp shall not have a slope greater than 1 foot rise in 12 feet, or 8.33 percent, or 4 degrees 50 minutes.

5.1.2 A ramp shall have handrails on at least one side, and preferably two sides, that are 32 inches in height, measured from the surface of the ramp, that are smooth, that extend 1 foot beyond the top and bottom of the ramp, and that otherwise conform with American Standard Safety Code for Floor and Wall Openings, Railings, and Toe Boards, A12-1932.

NOTE: Where codes specify handrails to be of heights other than 32 inches, it is recommended that two sets of handrails be installed to serve all people. Where major traffic is predominantly children, particularly physically disabled children, extra care should be exercised in the placement of handrails, in accordance with the nature of the facility and the age group or groups being serviced.

NOTE: Care should be taken that the extension of the handrail is not in itself a hazard. The extension may be made on the side of a continuing wall.

5.1.3 A ramp shall have a surface that is nonslip.

5.1.4 A ramp shall have a level platform at the top which is at least 5 feet by 5 feet, if a door swings out onto the platform or toward the ramp. This platform shall extend at least 1 foot beyond each side of the doorway.

5.1.5 A ramp shall have a level platform at least 3 feet deep and 5 feet wide, if the door does not swing onto the platform or toward the ramp. This platform shall extend at least 1 foot beyond each side of the doorway.

5.1.6 Each ramp shall have at least 6 feet of straight clearance at the bottom.

5.1.7 Ramps shall have level platforms at 30-foot intervals for purposes of rest and safety and shall have level platforms wherever they turn.

5.2 Entrances

5.2.1 At least one primary entrance to each building shall be usable by individuals in wheelchairs.

NOTE: Because entrances also serve as exits, some being particularly important in case of an emergency, and because the proximity of such exits to all parts of buildings and facilities, in accordance with their design and function, is essential (see 112 and 2000 through 2031 of American Standard Building Exits Code, A9.1-1953) it is preferable that all or most entrances (exits) should be accessible to, and usable by, individuals in wheelchairs and individuals with other forms of physical disability herein applicable.

5.2.2 At least one entrance usable by individuals in wheelchairs shall be on a level that would make the elevators accessible.

5.3 Doors and Doorways

5.3.1 Doors shall have a clear opening of no less than 32 inches when open and shall be operable by a single effort.

NOTE: Two-leaf doors are not usable by those with disabilities defined in 2.1, 2.2, and 2.5 unless they operate by a single effort, or unless one of the two leaves meets the requirement of 5.3.1.

NOTE: It is recommended that all doors have kick plates extending from the bottom of the door to at least 16 inches from the floor, or be made of a material and finish that would safely withstand the abuse they might receive from canes, crutches, wheelchair foot-platforms, or wheelchair wheels.

5.3.2 The floor on the inside and outside of each doorway shall be level for a distance of 5 feet from the door in the direction the door swings and shall extend 1 foot beyond each side of the door.

5.3.3 Sharp inclines and abrupt changes in level shall be avoided at doorsills. As much as possible, thresholds shall be flush with the floor.

NOTE: Care should be taken in the selection, placement, and setting of door closers so that they do not prevent the use of doors by the physically disabled. Time-delay door closers are recommended.

NOTE: Automatic doors that otherwise conform to 5.3.1, 5.3.2, and 5.3.3 are very satisfactory.

NOTE: These specifications apply both to exterior and interior doors and doorways.

5.4 Stairs. Stairs shall conform to American Standard A9.1-1953, with the following additional considerations:

5.4.1 Steps in stairs that might require use by those with disabilities defined in 2.2 and 2.5 or by the aged shall not have abrupt (square) nosing.

NOTE: Individuals with restrictions in the knee, ankle, or hip, with artificial legs, long leg braces, or comparable conditions cannot, without great difficulty and hazard, use steps with nosing, but can safely and with minimum difficulty use steps with nosing curved.

5.4.2 Stairs shall have handrails 32 inches high as measured from the tread at the face of the riser.

NOTE: Where codes specify handrails to be at heights other than 32 inches, it is recommended that two sets of handrails be installed to serve all people. Where traffic is predominantly children, particularly physically disabled children, extra care should be exercised in the placement of handrails in accordance with the nature of the facility and the age group or groups being serviced. Dual handrails may be necessary.

5.4.3 Stairs shall have at least one handrail that extends at least 18 inches beyond the top step and beyond the bottom step.

NOTE: Care should be taken that the extension of the handrails is not in itself a hazard. The extension may be made on the side of a continuing wall.

5.4.4 Steps should, wherever possible, and in conformation with existing step formulas, have risers that do not exceed 7 inches.

5.5 Floors

5.5.1 Floors shall have a surface that is nonslip.

5.5.2 Floors on a given story shall be of a common level throughout or be connected by a ramp in accord with 5.1.1 through 5.1.6, inclusive.

EXAMPLE 1: There shall not be a difference between the level of the floor of a corridor and the level of the floor of the toilet rooms.

EXAMPLE 2: There should not be a difference between the level of the floor of a corridor and the level of a meeting room, dining room, or any other room, unless proper ramps are provided.

5.6 Toilet Rooms. It is essential that an appropriate number[8] of toilet rooms, in accordance with the nature and use of a specific building or facility, be made accessible to, and usable by, the physically handicapped.

5.6.1 Toilet rooms shall have space to allow traffic of individuals in wheelchairs, in accordance with 3.1, 3.2, and 3.3.

5.6.2 Toilet rooms shall have at least one toilet stall that--

(1) Is 3 feet wide

(2) Is at least 4 feet 8 inches, preferably 5 feet, deep

(3) Has a door (where doors are used) that is 32 inches wide and swings out

(4) Has handrails on each side, 33 inches high and parallel to the floor, 1½ inches in outside diameter, with 1½ inches clearance between rail and wall, and fastened securely at ends and center

(5) Has a water closet with the seat 20 inches from the floor

NOTE: The design and mounting of the water closet is of considerable importance. A wall-mounted water closet must be used, it should not have a front that is wide and perpendicular to the floor at the front of the seat. The bowl should be shallow at the front of the seat and turn backward more than downward to allow the individual in a wheelshair to get close to the water closet with the seat of the wheelchair.

5.6.3 Toilet rooms shall have lavatories with narrow aprons, which when mounted at standard height are usable by individuals in wheelchairs; or shall have lavatories mounted higher, when particular designs demand, so that they are usable by individuals in wheelchairs.

NOTE: It is important that drain pipes and hot-water pipes under a lavatory be covered or insulated so that a wheelchair individual without sensation will not burn himself.

5.6.4 Some mirrors and shelves shall be provided above lavatories at a height as low as possible and no higher than 40 inches above the floor, measured from the top of the shelf and the bottom of the mirror.

---

[8] See 2.13.

5.6.5 Toilet rooms for men shall have wall-mounted urinals with the opening of the basin 19 inches from the floor, or shall have floor-mounted urinals that are on level with the main floor of the toilet room.

5.6.6 Toilet rooms shall have an appropriate number[8] of towel racks, towel dispensers, and other dispensers and disposal units mounted no higher than 40 inches from the floor.

5.7 Water Fountains. An appropriate number[8] of water fountains or other water-dispensing means shall be accessible to, and usable by, the physically disabled.

5.7.1 Water fountains or coolers shall have up-front spouts and controls.

5.7.2 Water fountains or coolers shall be hand-operated or hand- and foot-operated. (See also American Standard Specifications for Drinking Fountains, Z4.2-1942.)

NOTE: Conventional floor-mounted water coolers can be serviceable to individuals in wheelchairs if a small fountain is mounted on the side of the cooler 30 inches above the floor.

NOTE: Wall-mounted, hand-operated coolers of the latest design, manufactured by many companies, can serve the able-bodied and the physically disabled equally well when the cooler is mounted with the basin 36 inches from the floor.

NOTE: Fully recessed water fountains are not recommended.

NOTE: Water fountains should not be set into an alcove unless the alcove is wider than a wheelchair. (See 3.1.)

5.8 Public Telephones. An appropriate number[8] of public telephones should be made accessible to, and usable by, the physically disabled.

NOTE: The conventional public telephone booth is not usable by most physically disabled individuals. There are many ways in which public telephones can be made accessible and usable. It is recommended that architects and builders confer with the telephone company in the planning of the building or facility.

5.8.1 Such telephones should be placed so that the dial and the handset can be reached by individuals in wheelchairs, in accordance with 3.3.

5.8.2 An appropriate number[8] of public telephones should be equipped for those with hearing disabilities and so identified with instructions for use.

NOTE: Such telephones can be used by everyone.

5.9 Elevators. In a multiple-story building, elevators are essential to the successful functioning of physically disabled individuals. They shall conform to the following requirements:

5.9.1 Elevators shall be accessible to, and usable by, the physically disabled on the level that they use to enter the building, and at all levels normally used by the general public.

5.9.2 Elevators shall allow for traffic by wheelchairs, in accordance with 3.1, 3.2, 3.3 and 5.3.

5.10 Controls. Switches and controls for light, heat, ventilation, windows, draperies, fire alarms, and all similar controls of frequent or essential use, shall be placed within the reach of individuals in wheelchairs. (See 3.3.)

5.11 Identification. Appropriate identification of specific facilities within a building used by the public is particularly essential to the blind.

5.11.1 Raised letters or numbers shall be used to identify rooms or offices.

5.11.2 Such identification should be placed on the wall, to the right or left of the door, at a height between 4 feet 6 inches and 5 feet 6 inches, measured from the floor, and preferably at 5 feet.

5.11.3 Doors that are not intended for normal use, and that might prove dangerous if a blind person were to exit or enter by them, should be made quickly identifiable to the touch by knurling the door handle or knob.

EXAMPLE: Such doors might lead to loading platforms, boiler rooms, stages, fire escapes, etc.

5.12 Warning Signals

5.12.1 Audible warning signals shall be accompanied by simultaneous visual signals for the benefit of those with hearing disabilities.

5.12.2 Visual signals shall be accompanied by simultaneous audible signals for the benefit of the blind.

5.13 Hazards. Every effort shall be exercised to obviate hazards to individuals with physical disabilities.

5.13.1 Access panels or manholes in floors, walks, and walls can be extremely hazardous, particularly when in use, and should be avoided.

5.13.2 When manholes or access panels are open and in use, or when an open excavation exists on a site, particularly when it is approximate to normal pedestrian traffic, barricades shall be placed on all open sides, at least 8 feet from the hazard, and warning devices shall be installed in accord with 5.12.2.

5.13.3 Low-hanging door closers that remain within the opening of a doorway when the door is open, or that protrude hazardously into regular corridors or traffic ways when the door is closed, shall be avoided.

5.13.4 Low-hanging signs, ceiling lights, and similar objects or signs and fixtures that protrude into regular corridors or traffic ways shall be avoided. A minimum height of 7 feet, measured from the floor, is recommended.

5.13.5 Lighting on ramps shall be in accord with 1201, 1202, 1203, and 1204 of American Standard A9.1-1953.

5.13.6 Exit signs shall be in accord with 1205 of American Standard A9.1-1953, except as modified by 5.11 of this standard.

SPECIFICATIONS
FOR
BUS FOR PHYSICALLY HANDICAPPED STUDENTS
FOR
THE UNIVERSITY OF MISSOURI

SPECIFICATIONS
FOR
BUS FOR PHYSICALLY HANDICAPPED STUDENTS
FOR
THE UNIVERSITY OF MISSOURI

1. GENERAL:

a. The bus unit required under the accompanying request shall be a city transit type of pusher design, mounted on a chassis especially built for passenger bus use to provide comfortable riding qualities and short turning radius. The body shall be modified for loading and transporting wheelchair students; its use will be primarily in city traffic in the college campus area.

b. Conventional seating shall consist of a davenport seat across the rear of coach and four (4) seats approximately 48" long positioned over each wheel housing, with backs against walls. The remainder of the floor area should be devoted to wheel chair space and to entrance and exit facilities.

c. Coach construction and equipment shall conform to Missouri State School Bus Regulations, and shall specifically include the additional items and features listed below.

2. COACH REQUIREMENTS:

a. Interior:

(1) Headroom, floor to ceiling, 76" minimum.

(2) Passenger seats, coil spring cushions padded and upholstered with good quality 29 oz. cloth backed vinyl fabric.

(3) Driver's seat to be adjustable for height and for leg room and shall be mounted to provide shock absorber action. Cushion and back to be contoured along bucket seat lines. To be Bostrom Corporation's "Viking" or approved equal.

(4) Heaters - two hot water type; one fresh air style in front and one recirculating under seat type near rear of bus. Total heating capacity to be not less than 160,000 B.T.U.

(5) Windshield defroster unit, hot water type, with full width discharge for complete windshield clearance.

(6) Two (2) 6" electric defroster fans, one left and one right hand end of windshield.

(7) Adjustable sun visor driver's side.

(8) Interior mirror 6" x 30".

(9) Stainless steel stanchion and handrails at doorways. Also stainless steel locking bars along sidewalls, below window level, for securing wheel chairs to wall of bus during transit.

(10) Non-slip surfacing over entire floor and on entrance steps. To be "Grip-Dek" as manufactured by Pabco Paint Division of Fiberboard Paper Products Corporation, San Francisco, California, or approved equal.

(11) Instruments: Driver's instrument panel shall be fitted with the following indicators:

(a) Speedometer with total mileage register;

(b) Engine tachometer;
(c) Ampmeter charge indicator;
(d) Engine oil pressure gauge;
(e) Air pressure gauge;
(f) Fuel level indicator;
(g) Engine high temperature warning light;
(h) Low air pressure audible warning.

b. Exterior:

(1) Dual electric windshield wipers.

(2) Dual 6" x 16" extension rear view mirrors.

(3) Tinted windshield with green band tint across top of windshield.

(4) Blanket fiberglass insulation, walls and roof. Full undercoating under floor, wheel housings, etc.

(5) Two sets of doors, four leaf folding type, located on right hand side: one set for chair lift to be located ahead of front wheel, and other set for pedestrians, to be located behind the rear wheel. Doors shall be operated pneumatically and independently controlled from two locations; i.e., from the driver's control panel and from the outside of the bus at a point beside the chair lift door. Pneumatic actuating devices are to be installed overhead and concealed inside the roof header.

(6) Power actuated lift for wheel chair passengers. (See detailed requirements under description of lift below.)

(7) Special two tone paint - white top, with metallic gold sides (Dupont No. 181-27149). Black trim and lettering "University of Missouri" on both sides in 5" block style letters.

3. CHASSIS REQUIREMENTS:

a. G.V.W. rating of approximately 23,000 lb. with front axle rated at 11,000 lb. Rear axle rating to be 17,000 lb. single speed, with approximately 7.2 to 1 gear ratio.

b. Turning radius over tires should not exceed 33 feet.

c. Engine to be gasoline type of heavy duty design having a displacement of not less than 332 cubic inches. Exhaust valves to be sodium filled or stellite faced.

d. Electrical system to be rated at 12 volts, with dual belt drive alternator of 100 ampere output capacity, (with matching voltage regulator and rectifier). Batteries (2) 6 volt each, totaling 200 ampere capacity at 20 hour rate, connected in series.

e. Carburetor to be two venturi, down draft type. Fuel pump to be electrically operated.

f. Transmission to be a hydraulic torque converter in combination with a six (6) speed forward and clutch and hydraulic retarder.

1st - 5.296 to 1
2nd - 3.81 to 1
3rd - 2.69 to 1
4th - 1.936 to 1
5th - 1.39 to 1
6th - 1.00 to 1

Transmission to be an Allison MT-30 - Torquematic.

g. Service brakes to be hydraulically operated with air booster and shall have a minimum of 625 square inches of lining area. Hand brake may operate on drum at rear of transmission.

h. Air compressor should have an output capacity of not less than 12 C.F.M. at 1250 R.P.M. and should be engine mounted and independently driven, not serving as a jackshaft for cooling fan or generator drive. Air reserve tank should have a capacity of not less than 1240 cubic inches.

i. Shock absorbers - double acting, piston type, front and rear axles.

j. Tires - 9:00 x 20, 10 ply single front, dual rear - no spare, wheels to be disc type, 10 stud Budd - one spare.

k. Steering to be power assisted by hydraulic piston attached to drag link or idler arm. (Not to tie rod.)

l. Cooling system to be temperature controlled by means of a thermostatically actuated radiator shutters.

4. WHEEL CHAIR LIFT:

a. Construction:

The lifting device for loading wheel chair passengers shall be an electrically controlled hydraulically powered, platform style unit, patterned on the order of a truck elevating tailgate. It is to be installed in the right hand side of the coach, forward of the front wheel, with the platform to fold and automatically lock in a vertical position inside the coach, with clearance for doors to close during travel. (Opening and closing of doors to be pneumatic operation.) The loader shall incorporate these additional features and shall meet the following specifications:

(1) Platform size 30" wide x 42" deep, minimum;

(2) Lifting capacity 600 lbs. minimum;

(3) Height of travel, floor level to ground level;

(4) All parts of the loader shall be fabricated of steel and the platform is to be fully supported by lifting arm and hydraulic cylinder to provide stable operation regardless of load distribution;

(5) Lowering as well as raising shall be under power, with direction change to be accomplished by means of electric valves to control direction of flow of hydraulic fluid in actuating pistons;

(6) Hydraulic pump to be powered by a 12 volt D.C. motor;

(7) Platform of hoist shall be fabricated of smooth steel, but exposed surface shall be made non-slip by the application of aluminum oxide granules, sharp sand or similar abrasive bonded to the surface by a durable enamel or other adhesive to give a corrosion protective coating;

(8) All hinge or pivot joints of lift shall be fitted with pressed bushings and pressure lubricated grease fittings;

(9) Provision shall be made for sealing the floor opening around the lift against wind, noise and road splashing while traveling with the lift in the retracted position;

(10) To alleviate as much as possible the problem of congealed oil in the lift system during cold weather, hydraulic lines and hot water heater lines should be installed in close proximity to the fullest extent possible in order to keep the hydraulic fluid warmed effectively.

b. Operation of doors and chair lift:

Operation of lift and doors shall be controlled at either of two locations: (1) from the driver's control panel at left hand side of his seat, and (2) from the outside of the vehicle at a point beside the front (chair lift) entrance. A master switch for the lift system, two two-position toggle switches (one for each set of doors) and two push buttons (one up and one down) for lift shall constitute the driver's controls; controls in the outside wall of the coach at the left side of lift entrance (as viewed from outside) will consist of two two-position toggle switches for doors and one two-position (up and down) "momentary on" toggle switch to raise and lower the lift. The sequence of operation should be as follows:

(1) Energize control system by closing master switch on driver's panel.

(2) To operate chair lift:

(a) Move "front" door two-position toggle switch to "open" position.
(b) Press "down" button, holding closed, to lower platform to horizontal at bus floor level.
(c) After passenger has rolled onto platform, again press "down" button for lowering to street level. (Platform will stop at any point if pressure on button is released.)
(d) When passenger has moved off platform, driver can raise platform by pressing "up" button, maintaining pressure on button until lift is at floor level, pressing the "up" button a second time* will retract the platform to a vertical position to permit closing doors.
(e) Close doors by moving "front door" toggle to the "closed" position.

*Note: As a safety feature during operation (d) above, a by-pass valve in hydraulic circuit shall permit no operation of the platform toward the vertical position as long as a five (5) lb. load remains on the platform.

(f) The rear (pedestrian) door can be opened or closed by positioning the (rear door) two position switch in the proper direction.
(g) The operation of the lift can be operated from outside the bus by means of the "front door" two-position toggle switch which is wired in parallel with the driver's front door switch. The pedestrian door at rear should also be controlled by a "rear door" switch adjacent to the front door, also wired in parallel to the corresponding control at the driver's panel.
(h) It is preferred that a two-position "momentary on" toggle switch be used for the outside control point for the lift instead of two separate buttons in the driver's panel, as described in paragraphs (b) and (d) above.